Engineering and Mining Journal

McGraw-Hill Co., Inc. Price, 20c. New York, August 23, 1919

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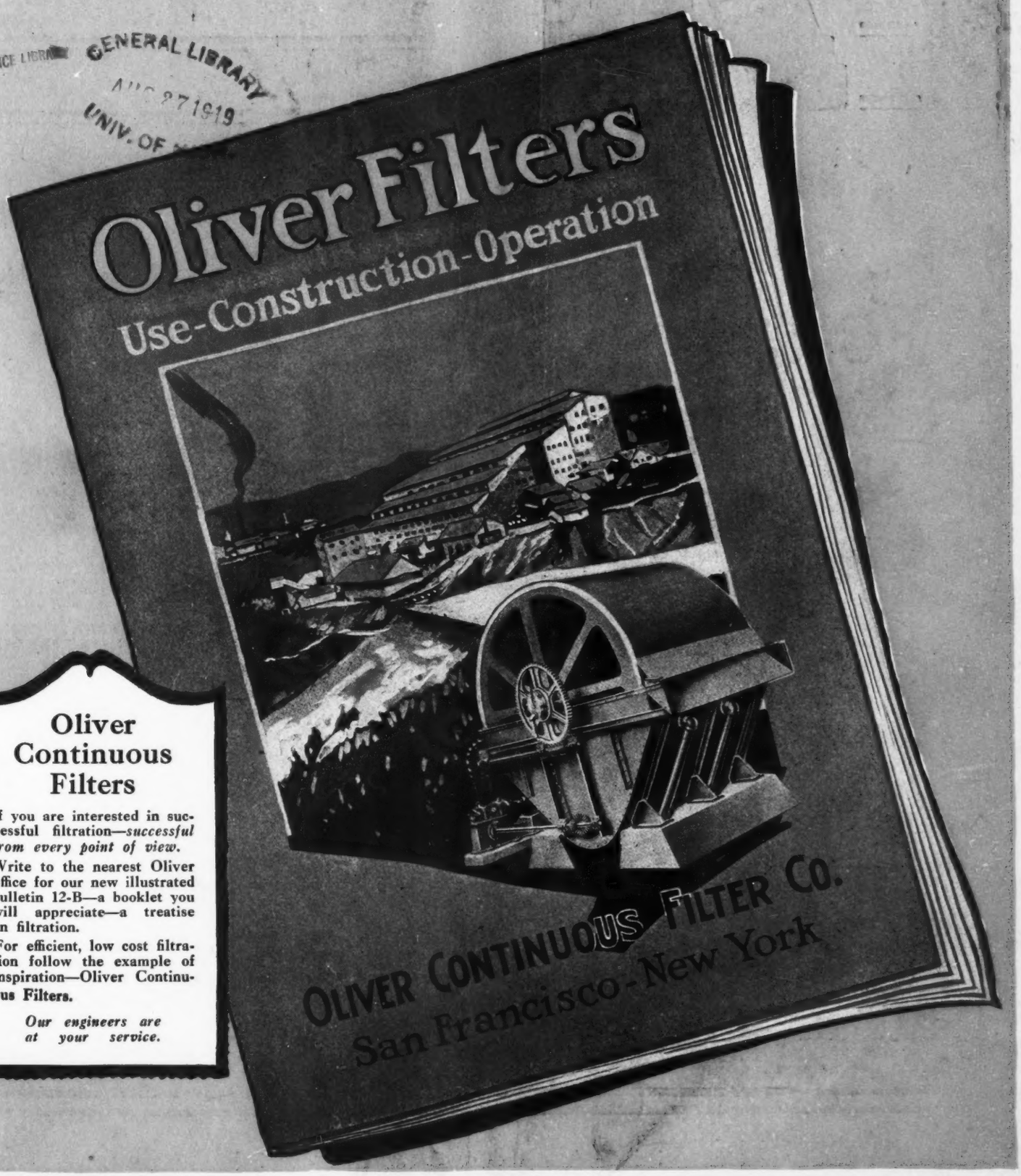

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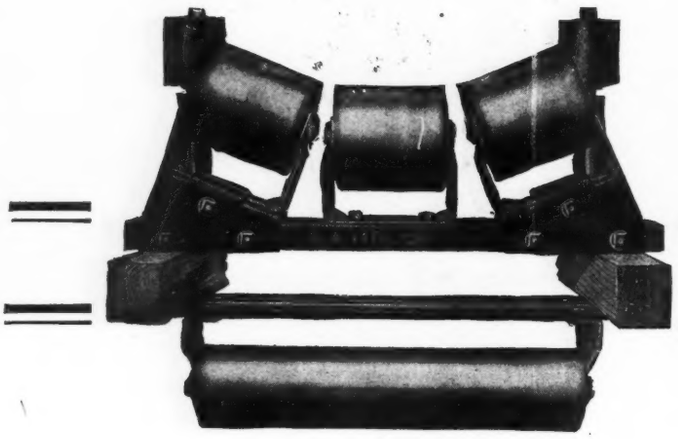

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Engineering and Mining Journal

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Volume 108 | New York, Saturday, August 23, 1919 | *Number* 8

The High Cost of Striking

IF ONE word is used more often than another in the headlines of the press nowadays it is "strike." Just how many of the country's workers are out on strike is hard to determine, but the number must be large. And now we are threatened with a railroad strike which will tie up the country's transportation systems "so tight that they will never operate again" if the union demands are not met. What are these men striking for? In the vast majority of cases it is either for a reduction in the cost of living or for higher wages, and in the latter we include the demand for shorter hours, for the same pay is expected regardless of the shorter time worked.

The reasons for this social unrest are varied, but there is an important one which is given too little attention. The workingman cannot understand why he is not living better than before the war. As a matter of fact, in many cases he is; the theaters, baseball games, and seashore resorts are crowded as never before, and it is not the salaried men or the rich who are patronizing them more than usual. However, we will consider only the cases of those who are not living as well as formerly, but insist that their standard of living shall be raised instead of lowered. They do not understand that most of the war is yet to be paid for, and that until it is paid for the standard of living of everyone should equitably be lowered.

Millions of men and women were engaged for four years in work which did not add one iota to the sum total of human wealth. The result was a scarcity of the essential things of life, followed, of course, by higher prices. Prices will come down when goods are more abundant, and they will be more abundant when more people work at essential industries, or when they work harder, or longer hours.

Every time a man strikes he increases the average cost of living in the world; every week that he works forty-four hours when he should work forty-eight he makes things just that much harder for himself and for everyone else.

What the world needs is more production—the wages that a man gets are unimportant from the world viewpoint. It is just now better for the community if a man does nine hours' work for $6 than eight hours' work for, say, $4, provided he does not become so affluent that he lays off for a month or two.

The workingman must be educated up to the fact that the war must be paid for, that the only way to pay for it is by more work, and that the high cost of living cannot be reduced by selling a comparatively small amount of army supplies at cost, or by legislation. It is just as important to refrain from luxuries now as during the war if we want to keep the cost of living down. Every time we indulge in a luxury we make some one work for our pleasure who could better be employed in producing something useful.

The best service that the American Federation of Labor could perform would be to discourage and prevent all strikes for a certain period of years and to recommend that every one work overtime as much as possible. Production would increase, prices would come down, and profiteering would decrease. Profiteers do not thrive in a falling market. By striking for better conditions the workingman is increasing the cost of living for himself as well as for others.

Coal Producers Face Competition

MINING and metallurgical plants throughout the United States are feeling keenly the rise in cost of fuel. Demands for metals during the war made the rise from $1 per ton at the pit mouth to $2.75 per ton bearable, but now that the war demands have ceased, the further threatened rise, due to the demands of labor for a six-hour day and a five-day week, points toward serious difficulties. When an elastic band is stretched too far it breaks, and the fellows at either end get stung. Just so with the price of coal: it cannot be stretched beyond the elastic limit, or something decidedly unpleasant will happen. And that unpleasantness is going to be felt by the consumer, the coal-mine owner, and the coal miner.

That many consumers of coal feel that the price has gone beyond the economic limit is evidenced by the failure of the public to respond to the entreaties of Government officials and coal producers to order their winter coal now. The public may be mistaken. Perhaps the economic price of coal belongs where it is or even higher, but it appears to the consumer that it would be more to the point if operators would devote their selling energies to the task of convincing labor that the price of coal must not go higher, and that if labor wants greater compensation than it is now receiving the best way to secure it is by getting out additional tonnage per man employed. This will be a hard task if it can be done at all, for labor feels so thoroughly intrenched that it is prepared to defy operators rather than to listen to reasonable arguments from them. Labor's attitude seems to be one of antagonism rather than of assistance in this crisis.

There is, however, the possibility of relief to the consumer from an entirely outside source. Fuel oil, when once adopted, is seldom replaced by coal. Both mine owners and coal miners now face this formidable competitor, both as a fuel to be used under boilers, and the lighter forms direct in oil engines. The change from solid fuel to heavy petroleum for making steam is not an expensive operation. The installation of a modern high-class oil engine is costly, but once in place its economy of operation is apparent, and those employing it seldom revert to the use of coal.

The Atlantic ports are particularly favored for the

introduction of liquid fuel, because of the vast stores on the coasts of Mexico. Already Massachusetts manufacturers are considering its use. The Standard Oil Co. is building a large refinery at Providence, and another is being built at Charleston, S. C. The Sinclair company will build refineries at Boston, New York, and Philadelphia.

Our whole coast line is in a position to change advantageously from solid to liquid fuel; and the consumption of coal along our shores is no slight portion of our normal output.

Only a small quantity of the lighter fuels are distilled from the Mexican oils, but their amount is sufficient to more than pay the cost of transportation and refining, leaving a fuel residue that may be sold profitably at almost any price. Four barrels of heavy fuel oil are equivalent to about a ton of coal, and the cost of the former at any Atlantic port need not exceed the cost of carrying an equivalent weight of coal from the mines to the same port.

The Shipping Board recently advertised for 34,000,000 bbl. of fuel oil for its vessels, the equivalent of about 9,000,000 tons of coal. It behooves coal operators to point out to their miners that the rising price of coal is encouraging the introduction of oil-burning plants and that at no distant date the miner may be begging for a week to be increased to six days rather than demanding that his working period shall be reduced to five.

The smelter and refiner may see a ray of hope in the possibility that the liberal substitution of oil for coal, by others, may increase the stocks from which their own supplies are drawn.

A Fable

"IT HAPPENED that a Dog had got a piece of meat and was carrying it home in his mouth to eat it in peace. Now, on his way home he had to cross a plank lying across a running brook. As he crossed, he looked down and saw his own shadow reflected in the water beneath. Thinking it was another dog with another piece of meat, he made up his mind to have that also. So he made a snap at the shadow in the water; but as he opened his mouth the piece of meat fell out, dropped into the water, and was never seen more. Beware lest you lose the substance by grasping at the shadow."

Man has not changed in a thousand years. The fable has its counterpart in modern metallurgy:

"A Corporation once secured control of a useful process. It had an opportunity to render valuable service to thousands of smaller organizations engaged in the recovery of minerals. The small companies were willing to pay for the privilege of using the process, to pay a fair price, cheerfully, and for an indefinite period. They were ready to regard the large Corporation as a benefactor, a big brother, a powerful friend who extended to them a helping hand; one who could indicate to them a way to transform a doubtful venture into a profitable enterprise. The large organization was given the opportunity to make thousands of grateful friends, to render a great service, and to receive willing tribute which would have poured into its coffers in a steady stream to be measured in millions. The expenses of the large Corporation would have been small compared to its income.

"But the large Corporation was covetous and extortionate. These qualities blinded it to its opportunity. It lacked broad vision. It missed its chance. The small companies, that would have paid reasonable royalties willingly, were amazed, and then exasperated. Possible friendship was converted into enmity. Co-operation was replaced by opposition. Then followed estrangement and bitterness.

"And litigation without end."

The Chemical Foundation

CRITICISM has been offered both of the work and the objects of the Chemical Foundation, but it must have come from those not fully informed. At a meeting of the National Cotton Manufacturers' Association A. Mitchell Palmer related the experience of his office in tracing the ownership of the German chemical industry in the United States, and Francis P. Garvan gave the reasons for the acquisition of German-owned patents and the formation of an organization to own them.

Conan Doyle never wrote a story that held the reader's attention more closely until the last page was read than Mr. Palmer when he set down his experience of detecting the camouflaged ownership of German industries in this country. Moreover, in the latter's story was the added interest of truth surpassing fiction. The care with which German industry, supported and abetted by its government, had laid its plans to control all chemical manufacture and trade in the United States is fully set forth. And then, when the Great War started, perfect team work was shown in arranging, by legitimate means where practicable and by illegimate means at other times, to keep out of their enemies' hands large quantities of munitions that would normally have reached France from this country. And still later is related the part that enemy aliens played in making our entry into the war of as little moment as possible. Not only did these things happen, but congratulatory letters were exchanged on the success of the perpetrator's duplicity.

We offer just one instance to illustrate the point. The following is quoted from a letter of appreciation addressed Dr. Albert, "Very Honorable Privy Councillor":

"The breadth of high-mindedness with which you at that time immediately entered into the plan has born fruit as follows: One and one-half million pounds of carbolic acid have been kept from the Allies; this equals 4,500,000 pounds of picric acid. This tremendous quantity of explosive was withheld from the Allies by your contract. (A contract that was, by the way, very profitable to its holders.) This is equivalent to three trains of explosives of forty cars each. Picture to yourself what a military coup would be accomplished by an army leader if he should succeed in destroying three trains carrying 4,500,000 pounds of explosives."

One's thoughts are divided between contempt for the authors who were capable of stooping to such means of gaining their objects, and admiration for the skill shown in working out the plans that succeeded.

Every American citizen should know of the work done by the Alien Property Custodian and the various Government departments that assisted in the work. A knowledge of what was found would be the strangest possible incentive toward the curtailment of importation of those things from Germany that can be made equally well in America.

The Chemical Foundation occupies about the same attitude to chemical industry that the Research Corpo-

ration holds toward metallurgy, and it merits corresponding support. It has taken over more than four thousand German patents, by far the greater part having to do with the manufacture of medicinal chemicals and dyes. There are many, however, that have a bearing on metallurgical operations and the manufacture of chemicals used in the treatment of ores.

We recommend to chemical and metallurgical engineers that they examine the list of patents now controlled by the Chemical Foundation. The rights for operating under these may be procured at trifling cost, and even this small tax goes toward the further development of the processes controlled.

Improving the Patent Office

MINING and metallurgical engineers will be interested in noting the progress being made by Engineering Council in its efforts to strengthen the Patent Office. With the co-operation of the National Research Council and the staff of the Patent Office, remedial legislation has taken form, and three bills have been introduced bearing on this question. H. R. 5011 detaches the Patent Office from the Department of the Interior and simplifies the procedure of the courts with reference to assessment of damages or profits for infringement. H. R. 5012 establishes a single Court of Patent Appeals, and H. R. 7010 increases the force and salaries in the Patent Office.

If legislators realized the importance of the proposed changes as do many engineers the proposed measures would be enacted speedily. Unfortunately, many legislators have not come into close contact with patent litigation, and fail to realize the crude condition of our laws. Unless advised of this by their constituents, and impressed by them with the necessity of revision, enactment will probably fail, or be indefinitely postponed.

National Highways

THE National Chamber of Commerce, because it has been strongly advocating a national highway system, calls attention to Senate Bill 1309, also introduced into the House, for the establishment of a national highway system and creation of a Federal Highway Commission.

To one point in the Chamber of Commerce report we take exception. It states that the national needs are "for interstate commerce, agriculture, postal delivery, common defense, and general welfare." Our exception is to the omission of the needs of mining operations, for they are as pressing as are any others.

Perhaps it is because of the small amount of direct revenue which mines yield to the states that their transportation requirements are generally overlooked by county and state authorities.

Many a prospect in the West has not been developed because of lack of roads, and many a small mine is small because no wagon or truck road reaches it. Throughout the Western states a small mine in an isolated locality must shift for itself until it becomes a rather large producer of ore or consumer of freight. Then county officials take notice, and a wagon road is built in time to take out the mill when it has passed into the condition of scrap.

In British Columbia they do things differently. Just as soon as the prospector in the North has shown enough to warrant his building a cabin for himself, up comes the surveyor, and a pack trail is cleared out. Then, as soon as there is any real evidence of a commercial quantity of ore being developed, the provincial authorities either build or assist in building a road.

Our mines are a national not a state industry, and any national system of highways should provide for extensions not only for the benefit of moving agricultural products but for the movement and development of mineral wealth. A striking example of this necessity came to light in 1918, when it was found that the West possessed rather extensive chrome deposits, but owners were unable to move their ore because of its distance from good roads. The same was true to a greater or less extent with manganese.

We heartily approve of a National Highway System, but we insist that the movement of mine products is as essential as the movement of agricultural products.

In the bill as drawn the commission is to be made up of three members elected from different geographical sections of the country, "not more than two to be of the same political party." It would have been better had it read, "not one of whom should be of any political party."

It is intimated that the three $10,000 commissioners are to be non-technical men, who are to have authority to appoint a chief engineer. This undertaking, if brought to fruition, will be one of strictly technical character, and though recognizing that engineers must be employed for laying out and doing the work, the spirit of the bill does not recognize that the commission should itself be made up of men already skilled in the science and practice of engineering. Perhaps a bill could not be passed wherein the best salaries were paid to men who understood the work they were called upon to perform, but it strikes us that the committee of the Chamber of Commerce, active in the campaign for national highways legislation, is of such calibre that it must see and know the importance of placing this work in the most competent hands available—the hands of engineers.

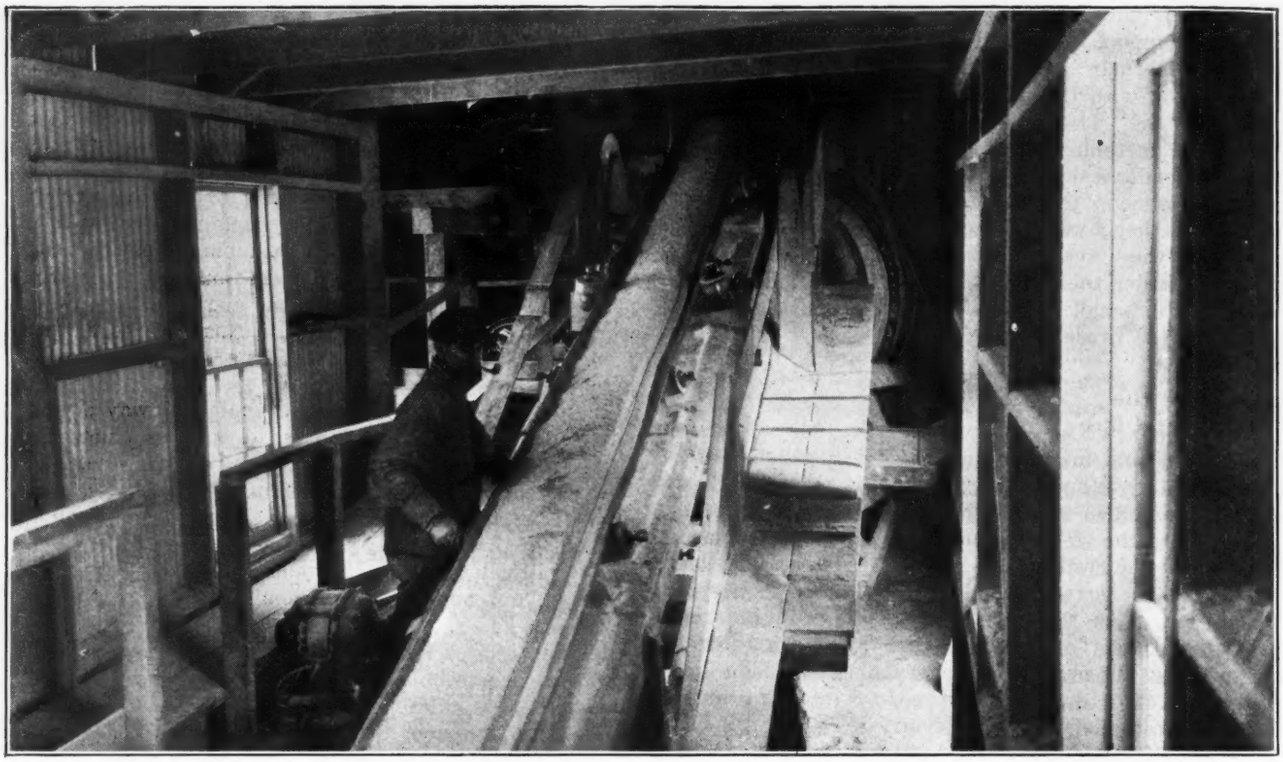
The Need for a Silver Exchange

THE United States is now the chief producer and distributor of silver, but the price of the metal is still regulated in London, where it has been controlled for many years. Has the time come when the producer shall have something to say regarding the price of his product?

It is evident that more adequate facilities for trading in silver, and stabilizing the price thereof, are needed. On page 301 of this issue of the *Journal* we publish an article by Srinivas R. Wagel, who suggests a medium whereby control over the price of silver may be exercised in the United States. We believe that Mr. Wagel's presentation will be read with interest, and we hope it may lead to instructive discussion and constructive criticism.

Citations

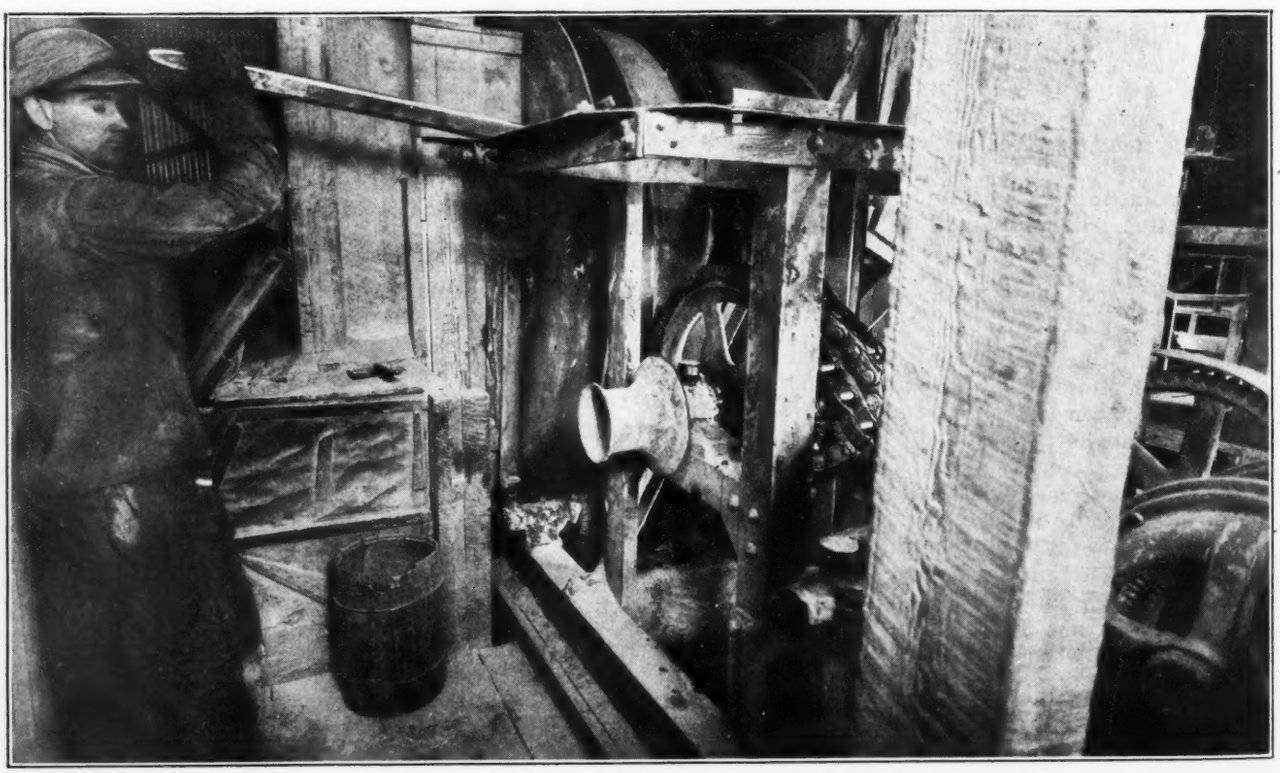
THOSE mining and metallurgical organizations which promised to re-employ, have re-employed, or are now re-employing their old service men who left to take part in the war are entitled to citations from the War and Navy departments. The Assistant Secretary of War requests that all employers who are entitled to this citation make application to him for it.



IRON AND MAGNESITE WEIGHED IN PROPER PROPORTION AND CONVEYED BY BELT TO MIXER

Mixing Iron and Magnesite

MIXER IN OPERATION AT MILL OF NORTHWEST MAGNESITE CO., CHEWELAH, WASH.



A Silver Exchange for New York

Unprecedented Demand for the White Metal, and the Passing of London as the Primary Market, Emphasize the Need of More Adequate Trading Facilities and of Stabilization Possible Only Through the Medium Suggested

BY SRINIVAS R. WAGEL

AFTER the demonetization of silver by the principal nations of the world, and the enthronement of gold as a sole standard of value, it was the general assumption that silver could play only a minor part in the currency of the world, serving principally as subsidiary money. Few believed in a war that, among other changes, would bring about a complete *volte face* in the relation between gold and silver and money. Gold no longer functions as the standard of value; it is not allowed even to circulate or to settle international balances of trade.

GOLD NOW ONLY A RESERVE

It is beginning to be realized that under conditions that are likely to prevail for the next few decades gold can serve only as reserve for circulation. Even as a reserve, it is unable fully to perform its function, because of the expansion in the issue of paper money, the circulation of which in all parts of the world is estimated at $35,000,000,000—exclusive of Russia. But the total gold reserve, outside of the United States, is barely $2,000,000,000. In countries like Spain, Italy, Norway, Denmark, and Switzerland silver performs the function of reserve side by side with gold. The only money in circulation consists of paper and silver. The demand for silver, principally for currency purposes, has been so great that the price of silver has actually doubled in the last three years. This demand is certain to increase with the settling down of the new states of Europe and the resumption of activity in the old countries.

UNITED STATES, MEXICO, AND CANADA SOLE SOURCES OF SILVER PRODUCTION

The only parts of the world where silver is produced in appreciable quantities are the United States, Mexico, and Canada. Nature has lavished upon these countries a wealth of silver; and the whole world is dependent upon their production to provide the metal needed for the regulation of its economic life. Canada is a poor third, because the production there is decreasing, the total for 1919 being estimated at less than 18,000,000 oz. The output of the United States and Mexico in 1919 will be about 120,000,000 oz. of the total estimated production of the world of 160,000,000 oz. But this total will be far from sufficient to meet the needs. The average offtake in India and China in a normal year is about 120,000,000 oz. In 1918, shipments from the United States ports to India and China amounted to 192,000,000 oz. Most of it, however, was contributed by the melting of silver dollars in the U. S. Treasury.

Every country is clamoring for silver, and the only way to meet the demand will be by the increased production from the mines of the United States and Mexico. Apart from the question of profits, it is imperative that the nations, many newly created, be assisted to get on a sound financial basis, and that responsibility lies almost entirely with the United States. Enterprise in Mexico is three-quarters American, and both geological and political conditions necessitate development of the friendly influence of the United States in Mexico.

UNITED STATES CHIEF DISTRIBUTOR OF SILVER

In former years, although the largest producer in the world, the United States was content to let Great Britain distribute the metal and control prices. Today such distribution of the metal is being done mainly by the United States. In 1911 America sent 51,000,000 oz. to the United Kingdom, 9,000,000 oz. to Asia, and the remainder of 4,000,000 oz. to the rest of the world. In 1917 the United States sent 27,000,000 oz. to the United Kingdom, 50,000,000 oz. to Asia, and the balance of 2,000,000 oz. to other countries.

Direct exportation to the various countries is the present practice. Nevertheless, the price is still being regulated from London, except during the period of about twelve months when the Treasury fixed the maximum price, after consultation with British interests. The price of silver has for many years been determined by London, whatever may be the condition of the local market or the consuming markets of the world.

It has not generally been understood that the London dealers who acted as middlemen between the United States producers and the consumers in the various parts of the world have no interest in the high price of silver; that the British government in India, being the largest purchaser of the metal for coinage, is not likely to look with favor on any effort to maintain the price of the metal; that the China markets, controlled by European interests, will not favor the high price of silver, because it affects the volume of trade; and that a foreign market will not look with favor on any effort to benefit the producers of the United States. It is all very well to say that supply and demand regulate prices, but a great deal depends upon the regulation by the interests that act as distributors.

LONDON, BOMBAY, SHANGHAI, AND HONGKONG THE CHIEF FOREIGN SILVER MARKETS

The principal silver markets of the world outside of the United States are London, Bombay, Shanghai, and Hongkong. In all these places stocks are kept, and prices vary from day to day, according to the stock on hand, the volume of trade, the nature of the trade, and the demands of currency. London takes stock of all these conditions, and generally of the status of the New York market, in fixing prices from day to day. Except in special periods, prices in all of these places have always tended to stabilize themselves; for if the metal was cheaper in one place than another, the demand naturally went to that center to buy until the price was raised to the level prevailing in other countries. But the regulation was manipulated, so that the

tendency was always toward depressing the value of the white metal and ignoring the interests of United States producers altogether. London was not interested in a big demand for silver in India, China, or in any other country; the pound sterling was the medium of trade, and the lower the value of silver the better for the country that controlled the international medium of circulation.

It is not to be presumed that London had a deliberate plan for purposely keeping down silver prices, or to work against the interests of the United States and other silver-producing countries. It was purely a question of self-interest. London was a buying and distributing market, and it is only natural that such a market should take no pains to keep the price of silver at a high level. It is against human nature that a buyer should be anxious to pay a higher price than he has to. It is equally against all experience that the seller, as the United States has been in the silver market, should voluntarily lose all control over the trade in the commodity that he sells.

Instability of Sterling Exchange Has Made American Dollar Standard of Value

There has been a material change in conditions as a result of the war. The most noteworthy and important of all is the instability of sterling exchange. In former times, the only currency that had a fixed value, and in terms of which the moneys of the world were measured, was the pound sterling. At present, the value of the pound sterling varies from day to day, and the only currency that has any stability is the American dollar. In former times, it might have been valid to argue that the fixing of the price in sterling was the most logical proceeding. Today, such an argument cannot be considered sound.

The second important modification in conditions is the relative position of Great Britain and the United States in world commerce and international finance. Before the war, Great Britain was the greatest creditor nation; the United States, with all its wealth and resources, remained a debtor. Today the United States alone, of all countries, is the greatest creditor nation, and England owes as much as five billion dollars to America.

The third change is the elimination of London as the intermediary in international finance. In former times, every nation brought its surplus funds to London, and consequently all nations that wanted to borrow went to London to find accommodation. Great Britain, being a borrower today, cannot accommodate other nations, and both neutrals and belligerents are coming to the United States to obtain money and materials.

The fourth is, as I have already mentioned, the increased importance of silver in the currency of the world. When London was the money center of the world, the British Empire was, as is the case at present, the producer of two-thirds of the total output of the world's gold. When gold is no longer serving the purpose of a circulating medium, it is fortuitous that the United States should be the largest producer of the only metal that is the basis of the circulating metallic money of the world. No great argument is needed to show that the rehabilitation of the world is greatly dependent upon increase in silver production—in the United States and Mexico.

The United States can perform its full duty only if control of the market is firmly established. If extraneous conditions and agencies should have the power to decide upon courses of action which will not be strictly in keeping with the interests of the United States, the country can do little or nothing but drift—as it has been doing for the last three or four decades. For instance, the price of silver has been at a materially low level for the last three weeks for no other reason but that sterling exchange in New York has been weak. This has nothing to do with supply and demand, and certainly not in the interests of American miners or trade. Still, the domestic market appears to have been helpless, because there is no agency by means of which it is possible to control the market.

Though there is legitimate complaint that the interests of all producers have not been safeguarded, it is neither fair nor advisable that the question should be treated solely from that point of view. Owing to the advent of new conditions, especially the part that the United States will have to play in the hegemony of the world, any proposed step should have an international import. Silver being for all practical purposes the only metallic circulating medium—for the present at least—the United States must consider not only domestic interests, but also those of the various nations with which America trades. Even within the United States itself, the interests of the miner, smelter, and dealer are not all identical; and, consequently, a plan for the better regulation of the silver market of the world should take into consideration not only the interests of the miners, smelters, and dealers in the United States, but also the consumers and traders in other friendly countries.

It is not often recognized that, although not producers of the white metal, India, China, and Spain have sufficient stocks to disorganize the market of the United States if American producers take advantage of the present demands to force prices up to unconscionable levels. India has been known as the sink of silver, and supposing, for argument's sake, silver goes up to $2 per oz. there is no question that India can easily part with 500,000,000 or 600,000,000 oz. China, at a pinch, can sell over 100,000,000 oz., and Spain an equal amount—not to speak of the smaller European countries which have large stocks of silver. The international value of silver depends upon prices remaining high, consistent with stability, for at least a decade.

After careful consideration of all the points that I have detailed, it seems to me that the only plan by which it is possible to assure essential regulation of the silver market is that of creating a major market in New York—that to be achieved by the establishment of a Silver Exchange. It is an erroneous conception that this will mean a fight between London and New York. It is not at all improbable that the Exchange may lead to a closer co-operation between London and New York. Even before the war there were markets, independent of London, in Bombay, Shanghai, and Hongkong. Though there was interdependence between these markets, there were periods when it was cheaper to buy in Bombay or Shanghai than in London, although these two former markets were invariably supplied by London with the actual metal—originally shipped from New York. It was New York alone that had no volition and simply translated the London prices into United States currency.

The first essential of a sound market is that there should be equal facilities for both buying and selling. In all other silver markets, except New York, buying

and selling can be done to an extent several times that of the actual silver changing hands. New York alone has remained a selling market pure and simple. Such selling being in the hands of a few interests which have facilities for marketing in London, the great majority of producers are at times practically helpless. On the other hand, in London, Bombay, and Shanghai, where not an ounce of silver is produced, one can buy and sell a million ounces in a day.

It may be averred that these markets are speculative, and that it is an advantage that the United States has little or no speculation in silver. Anyone who is conversant to the slightest extent with economic principles will know that a market which is solely a buying or selling market can never be healthy, and that speculation is necessary to stabilize prices. This is evidenced by the operations in shares in the Stock Exchange, as well as in commodities like cotton, coffee, corn, and wheat in the several produce exchanges. If one follows the logic of eschewing speculation, there ought to be no selling market at all in London, Bombay, or Shanghai. That these markets both buy and sell in unlimited quantities, and have done so for decades, is proof positive of the fact that such is necessary and beneficial.

Present Plight of the Small Producer

The actual condition of the silver trade in New York is almost deplorable. The larger interests that have connections in foreign countries, of course, are not affected by the present situation; but numbers of smaller miners find it absolutely impossible to sell their silver except at reduced prices and to the bigger concerns. By retaining the market in London, certain large interests are able to control almost the whole of the production in the United States and Mexico. By allowing London to distribute the metal, such organizations avoid or minimize competition in the United States. It is not to be presumed that such a course is intentionally pursued. I believe it was an accidental evolution, and that it is only natural that those who exercise control should be unwilling to give it up easily.

But the situation in every respect is changing rapidly. First of all, London in the past was able to offer certain advantages which our market was unable to give. The London dealers financed purchases in China, India, and other countries with the aid of their banks, acceptances. Today, they are unable to offer the same facilities. Furthermore, several countries in the world are anxious to do direct business with the United States, the banks of which are in the enviable position of being able to offer the credit facilities which London was able to grant in the past.

Banks and bankers from all countries would gladly purchase silver in the United States, and avoid the double freight, insurance and the middlemen's profit which they have been obliged to pay for in London. But their friendly offers are always spurned here. Why? Because those who buy in this market can do so only if they have opportunities of selling the silver, whenever necessary. Silver purchases, except for that part used in arts, are mainly exchange transactions.

It is well known that it is not always necessary to ship the metal in order to conclude such exchange business. When done in volume, the silver is resold frequently in large quantities. There are no facilities for resales here, and purchasers are reluctantly returning to London. If there were an organization like the proposed Silver Exchange, purchases and sales could be made in large volume, as in other countries. Of course, care should be taken that speculation does not overreach itself. If purchases and sales are done by responsible parties, as, for instance, in the several well-established exchanges, speculation can always be kept at a healthy point.

In spite of the fact that the United States is the largest producer of silver in the world, the domestic silver trade is thoroughly disorganized. Concerted action even by the producers has many obstacles to encounter, owing to the special conditions prevailing in the market. There must be a mechanism to adjust the differences between the several parties interested in the silver trade, and such does not exist at present. The success of the trade depends on the smooth regulation of the differences between the producer, the dealer, the buyer, and the consumer. With the Silver Exchange in New York, all these parties could come together, and any differences could easily be adjusted.

The silver market will be healthy when the several points of view are disclosed to all those who have vital interests in the satisfactory progress of the commerce in silver. The main advantage of the Silver Exchange to the trade would be the creation of a buying market in the United States. As I have already stated, London buys and sells, and thus regulates the market. So also do the Bombay and Shanghai markets. For instance, if the consuming markets be dull, and it is known that the future is certain to bring about a good demand, the Exchange will be able to maintain prices by trading between the members.

Centralized Trading Would Prove a Benefit To Commerce in General

Of even greater import than this is the advantage that would accrue from having all the parties interested in the trade in one center. The buyers of silver come from all countries, and are generally banks of repute. It would add to the prestige of the United States if these buyers should deal here, directly or through representatives, and such direct representation would be not only a benefit to the silver trade but also to the general commerce of the United States with the rest of the world. New York is fast becoming a money center, and the establishment of the Exchange would facilitate this process.

With the changes brought about by the war, the trade of the United States is expanding, and it is the laudable ambition of American merchants to take their wares to all parts of the world. Incidentally, this means that they should buy largely in other markets. The Asiatic markets are not negligible, and if the American people are to trade with Asia they ought to have a correct appreciation of the silver position. Imports to China, for instance, although sold on a gold basis, are concluded on a silver basis by the Chinese dealers. Consequently, the American exporter must follow the silver market if he is to succeed. He must also operate in silver exchanges, as the Manchester dealers have done for a long time. How is it possible to do so if silver prices are controlled by London, and the Manchester dealers and other dealers of the European continent have the advantage over the American merchant? The merchants of the United States can develop the full strength of their position only if there be created a Silver Exchange in New York.

America Should Encourage Production of Silver

Silver is fast becoming the sole metallic money of the world, and as the wealthiest and most powerful country of the world, the United States has a responsibility which it cannot shirk. This responsibility lies in encouraging silver production in the United States and in adjacent countries in which the influence of the United States is potent. Such development will be greatly hampered if America does not exercise control over the price of silver, and such control cannot be obtained without a Silver Exchange.

Although it is beyond the scope of the producers or the consumers of silver to take direct interest in the international currency regulation, it may soon become necessary to make joint efforts at the present period of reconstruction, when silver bids fair to play a large part in the currency of the world. It is for the good of the world that the United States must maintain the lead which it has now attained, more by chance than by organized effort.

The American people must keep watch over legislation in Washington, as well as other countries, with regard to silver, and in every way make concerted efforts to protect the interests of that metal. Such efforts can be made successfully and results achieved, only if there shall be established a Silver Exchange in New York.

Audible Electric Signals in Industrial Plants*

Advantages of the Electric Horn With Code System Over the Ordinary Telephone for Notifying Employees When They Are Wanted

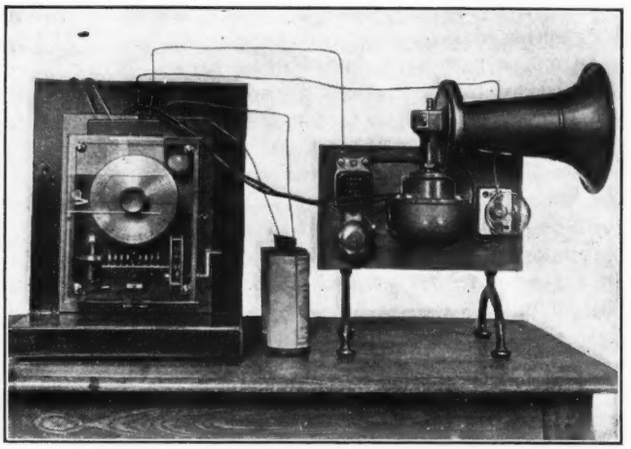
By V. Karapetoff
Professor of Electrical Engineering, Cornell University

A PRIVATE telephone system, however extensive, promptly establishes communication with any important employee only so long as the needed man is at his desk. As soon as he leaves his desk the problem of finding him becomes a hit-or-miss proposition. On the other hand, a superintendent, a foreman, or a repair man is ordinarily useful only in so far as he can move about the plant or property freely, without the fear that someone of importance may need him.

An electric signal can be introduced for notifying heads of departments or foremen when they are needed at the head office, and it is similar in construction to the familiar electric "horn" used on automobiles. It consists of a diaphragm with an anvil at its center. A toothed wheel driven by a small electric motor strikes the anvil many times a second and causes it to vibrate vigorously. The device is provided with a projector or horn, the shape of which depends on whether it is desired to scatter the sound, to intensify it in a horizontal direction, or to deflect it downward. Such motor-driven signals are now made much more powerful than automobile horns, and are wound for 110 or 220 volts, direct or alternating current, so that they can be connected to a lighting or power circuit, and do not require a separate low-voltage battery.

When someone who may be anywhere in the plant is desired, the telephone operator simply sounds this particular man's call, whereupon he comes to the nearest telephone, and reports, and the operator then connects him with the person at the other end. A special code-calling automatic instrument has been developed for this purpose. The operator merely sets the desired person's code number on a dial and pulls a lever. A contact-making mechanism is thereby set in motion, which closes the electric circuit and operates the code signals throughout the plant the required number of times (usually three times) and it stops automatically.

A further application of loud electric horns in industrial plants is for extensions to telephone bells. The ordinary telephone ringer is not loud enough in many shops when the foreman is away from his desk. In this case, a relay is connected in parallel with or in place of the telephone ringer, and when it is actuated it closes a secondary circuit, which causes an electric horn to sound. This call should be a single blast, to distinguish it from code calls.



APPARATUS FOR USING THE ELECTRIC SIGNAL HORN

A modern coal mine may have miles of passages and rooms underground, so that the superintendent and his assistants have to cover an extensive area. A system of powerful horns installed throughout the mine and connected to a code-calling instrument outside the mine would instantly convey any call, and the superintendent or whoever is called would come to the nearest telephone and report to the operator.

A further improvement of this system might consist in providing the superintendent, the foremen, the electrician and others with portable telephones, which could be connected to the line wires at any point. This is possible in many mines in which bare steel wires are used for the telephone circuit. In some mines, especially where rope haulage is used, the man on the train is given a piece of metal with which he short-circuits these two wires, and causes a signal gong to ring at the winding engine. In this case the telephones are connected through condensers, and electrical connections are used similar to those which permit simultaneous telegraphy and telephony over the same wires.

The same acoustic signals may be used for sounding emergency calls or for a general alarm, although the exact arrangement would have to be worked out separately to meet the conditions in each individual mine.

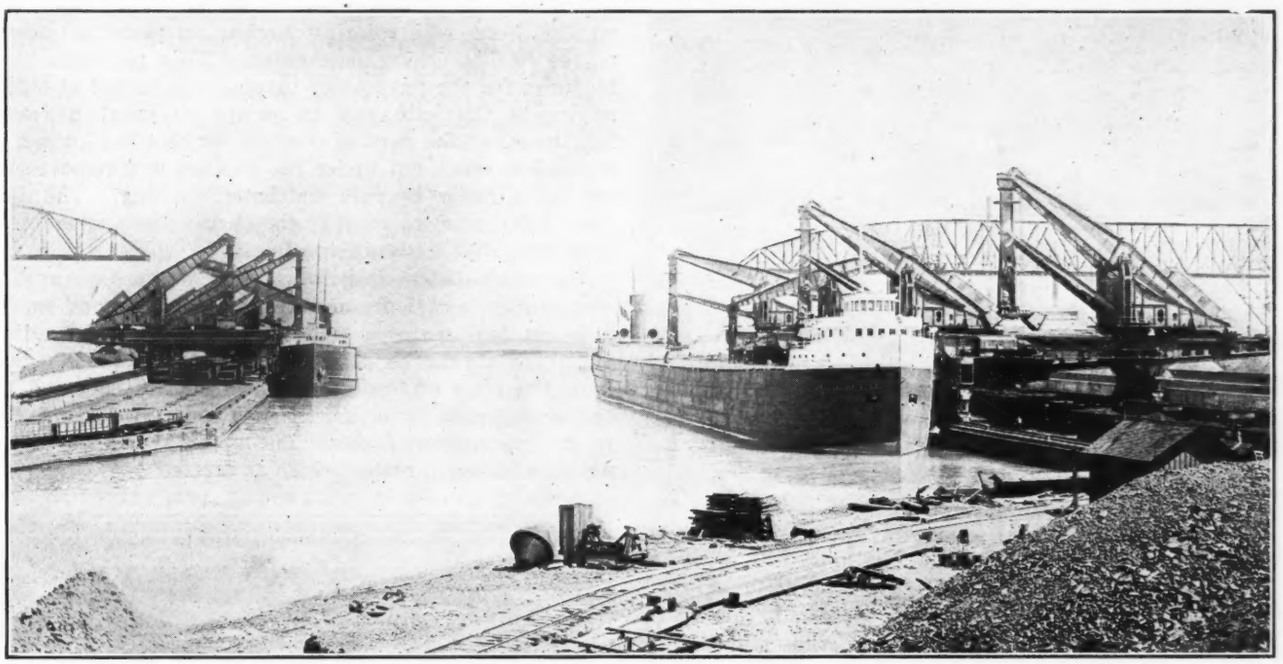
*Abstract from a paper presented before the Rochester (N. Y.) Section of the American Institute of Electrical Engineers, Apr. 25, 1919.

Rubber is one of the Few Commodities which has not advanced in price since the war began. The average New York wholesale price for Para Upriver fine grade in 1913 was about 92c. per lb. In July, 1919, the price was 55c.

An Automatic Iron-Ore Unloader

Electrically Driven Machines Are Used To Remove Iron Ore From Lake Carriers to Cars or Stockpiles Ready for Shipment to Furnaces—Entire Operation Automatic, And Controlled by Two Men

ONE of the most successful machines for removing iron-ore cargoes from Lake steamers that has been devised is the Wellman-Seaver-Morgan automatic unloader, shown in the accompanying illustrations. Although of large proportions, the design has been simplified, and the operation of the machine is such that excellent control is maintained at all times. The unloader consists of a main framework, mounted on trucks which travel along guide or runway rails, which extend back to the rear runway over a temporary storage pile, where the ore can be discharged if desired. Space is provided for railroad tracks between the front and rear runways, and cars placed under the machines may be loaded with ore for transportation to the furnace plants.



EIGHT ELECTRICALLY OPERATED IRON-ORE UNLOADERS ON THE DOCKS AT ASHTABULA, OHIO

The girders of the main framework form a support for runway rails. A trolley supporting a balanced walking-beam, from the outer end of which a stiff bucket leg depends, travels on the rails. At the lower end of the leg is the bucket, which is operated by machinery placed on the walking-beam. All horizontal movements of the bucket are accomplished by means of moving the trolley backward and forward on the girders, and vertical movements are effected by the operation of the walking-beam. When the forward portion of the beam is out of balance, the bucket descends by gravity as soon as the brakes of the hoisting mechanism are released. The hoisting-mechanism control is housed at the rear end of the walking-beam. Ropes from the winding drums of this mechanism pass around sheaves placed at the rear end of the trolley and are anchored to the walking-beam.

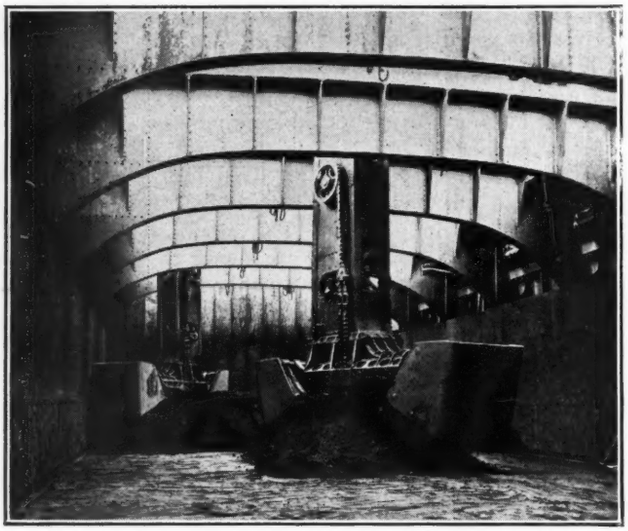
In addition to the main parts of the machine, there is also a hopper, placed at the forward end of the main framework and between the main girders, which receives the ore discharged from the bucket. The hopper, which has a capacity of about three bucket loads, serves as a balancing point for the ore between the bucket and the cars or storage as the case may be. The bottom of the hopper is provided with outlet gates, and the contents are discharged as required into a larry, which runs on an auxiliary track suspended from the under side of the main girders. The larry, after receiving its load from the main hopper, moves to a point where its contents can be discharged either into the cars standing on the railroad tracks beneath the main span of the girders or into a temporary storage pile under the cantilever at the rear of the machines. The ore so placed in this temporary stockpile cannot be reclaimed by means of these machines, as their function is solely one of unloading the cargo from the ships.

Unloading machines of this type have been made in two sizes, the smaller size having a capacity of ten tons and the larger a capacity of seventeen tons in the bucket shells. The larger type of machine, such as shown in accompanying illustrations, is electrically driven throughout, and its speeds are regulated so as to complete the cycle of operation in about fifty seconds.

Some idea of the tonnage unloaded by this method may be gathered from consideration of a record that was made at Ashtabula, Ohio. Eight machines, having a capacity of fifteen tons each, unloaded seven boats, at a total capacity of 70,000 tons, in twenty-two hours' actual time. At other points, four machines, working

in boats having capacities as high as 13,000 tons, have unloaded these cargoes in about three hours and twenty-five minutes.

The operation of the machine is as follows: After the boat has been docked, the machine is moved opposite one of the hatches and the bucket is lowered through the hatch into the ore. As soon as the bucket is filled, the walking-beam hoist mechanism is put in operation and the bucket hoisted out of the boat. Simultaneously, the



HOLD OF IRON-ORE BOAT, SHOWING BUCKET LEG OF UNLOADER IN THE ACT OF SCOOPING ORE

trolley moves back so that the bucket is brought over the main hopper between the girders in the main framework, and the contents are discharged into the hopper. The bucket is then immediately returned to the boat for another load. The ore in the main hopper is discharged into the larry, which has been brought to a point directly underneath the discharge gates of the hopper. The larry hopper is filled, and the larry moved over the desired discharge point, where the gates are opened to discharge the ore as required. The hopper is provided with scales so that the contents are accurately weighed and recorded. In this manner, a car can be loaded to capacity and an accurate record kept, thus eliminating the necessity for the use of track scales.

If railroad cars are not available for immediate shipment, the larry is moved to a position on the rear cantilever and its contents are discharged on a temporary storage pile, from which the material is usually reclaimed for shipment or storage by means of a bridge, situated on the runway at the rear of the unloader.

Unloading Operation Controlled by Two Men

Only two operators are required for the entire operation of one of these machines. One occupies a station in the bucket leg directly over the bucket shells, and controls all of the motions of raising and lowering the bucket, of traveling the trolley back and forth, and moving the machine along the dock from one hatch to another. The second operator is stationed in a cab on the larry, and controls the movement of the larry, the operation of the larry gates, and the weighing of the ore.

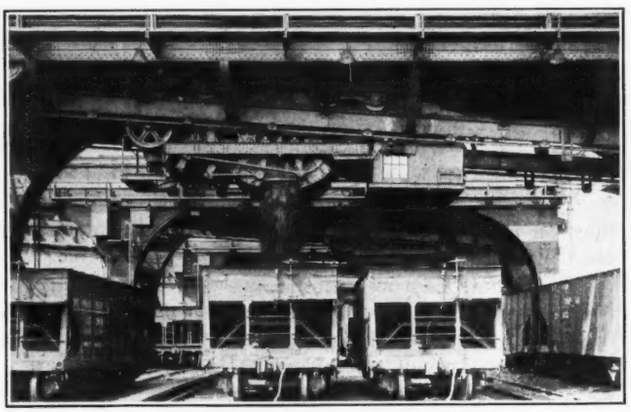
The bucket shells are each made of a single piece of plate and are usually provided with manganese-steel cutting lips, which are essential to resist the abrasive action of the ore. The shells themselves are carried on heavy cast-steel arms mounted on rollers that travel in guides in the fixed portion of the lower end of the bucket leg.

The motor used to operate and close the bucket is situated in the machinery house at the back of the walking-beam. Ropes from the bucket-closing mechanism are carried through the walking-beam and the bucket leg and are attached to a power drum in the bucket leg directly over the operator. This drum is geared to the closing chain drums. The bucket is closed by rotating the drums in the proper direction and opened by reversing the motor, which forces the bucket shells apart by means of an opening chain placed in the center of the bucket leg between the two closing chains.

Unloading Facilities of Bucket Leg

In addition to the vertical movement, which is given to the bucket leg by means of the walking-beam, it also has rotation about its vertical axis. This is accomplished by means of ropes attached to a segment on the bucket leg itself, the ropes being carried back in the walking-beam to a rotating mechanism placed adjacent to the bucket-closing mechanism. This motion is introduced for the purpose of turning the bucket at right angles to the hatchway to secure as great a reach lengthwise of the boat as possible, so that the bucket is enabled to reach out under the hatches and remove the ore not directly beneath the hatch opening. The distance from point to point of the bucket shells when open is approximately twenty-one feet.

The scale larry, into which the main hopper discharges, has a capacity of between thirty-five and forty-five tons, and two larry loads constitute a full carload of ore. The discharge gates of the larry are suspended from the sides of the larry frame and are operated by connecting rods which attach to cranks, also connected to the main larry frame. The gates are operated by means of a small motor which is carried at the rear of



SCALE LARRY DISCHARGING ORE

the larry, and are so arranged that all or a portion of the contents of the larry may be discharged. The hopper of the larry is suspended in the frame on scales so that the contents may be wholly or partly discharged and be accurately recorded.

The mechanism for moving the larry back and forth on its track is also situated on the larry and consists of winding drums upon which ropes are wound, the end of the rope being attached to the rear end of the cantilever on the main framework.

Although usually electrically driven, these machines have been made to operate by steam and hydraulic cylinders, water being supplied to the operating cylinders by means of a steam accumulator, which furnishes water at a pressure of 1,000 lb. per sq.in. The electrically operated machines are usually designed for a 220-v. direct current. Alternating current is never used. Motors required for the equipment of one of these machines are as follows: Beam hoist, 1 motor, 275 hp.; bucket closing, 1 motor, 120 hp.; bucket rotating, 1 motor, 25 hp.; trolley travel, 1 motor, 120 hp.; hopper gates, 1 motor, 100 hp.; longitudinal travel, 1 motor, 100 hp.; larry travel, 1 motor, 150 hp.; larry gates, 1 motor, 40 hp.

The regulating equipment for the motors is of the magnetic-switch type throughout, having master controllers placed in the operators' cabs in the bucket leg and on the larry.

Current is conducted to the machine by means of insulated rails running the length of the main runways, being collected from the rails by means of pick-up shoes and distributed to the various parts of the machine. A similar collecting device is also employed for supplying the main current to the trolley. Conductor rails are attached to the main framework, and the current is collected by means of pick-up shoes attached to the trolley.

Advantages Claimed for Unloader

Among the points of superiority claimed for the Wellman-Seaver-Morgan ore unloader are the following: The design is heavy. There is little to get out of order, which results in a low maintenance cost per ton of material handled. The control is accurate and positive, and manual labor is reduced to a minimum. The bucket is positively guided in passing through the hatches of ships, thus eliminating the danger of damage, either to the boat or to the machines, arising from the use of rope-suspended buckets. The operator travels with the bucket into the boat, and can always see exactly what he is doing. The bucket is of large capacity, but is so suspended from the walking-beam that the weight resting on the tank top of a boat is less than one-third of the weight of a rope-suspended bucket of equal capacity. In fact, it is impracticable to use a rope-operated bucket of the size attained on these unloaders.

An important consideration is the low operating cost obtainable with these machines. Records extending over long periods show unloading costs ranging from 2½ to 4½c. per ton, which includes superintendence, labor, repairs, and materials on the machines, as well as the cost for power and light.

Owing to the extreme reach of the bucket, it is possible for the machine to discharge a much higher percentage of a ship's cargo than can be accomplished by ordinary rope-operated buckets. The bucket can be rotated at right angles to the hatch and reach out for ore which would be entirely inaccessible to an ordinary bucket.

Mining in Colorado in 1918 and 1919

During 1918 Colorado mines produced $12,705,000 in gold, 6,900,000 oz. of silver, 66,000,000 lb. of lead, 6,190,000 lb. of copper, and 86,550,000 lb. of zinc, according to statistics compiled by the United States Geological Survey. The statistics for 1919 will show a considerable decrease in the output of all metals in the state. The production of gold alone will decrease at least $2,000,000.

If production is continued at the rate maintained for the first five months of 1919 the mines of Cripple Creek, which produced $8,125,000 in 1918, will produce $1,500,000 less in 1919. The Telluride district, which for several years has been the most persistent producing district in Colorado, will probably not equal its output of 1918, for the prevalence of influenza and lack of electric power reduced the output considerably during the winter and spring. The recent resumption of work at the Humboldt mines will help to maintain the output of silver.

The closing of the Smuggler mine and the idleness of the Wasatch mill, at Silver Plume, will mean a greatly reduced output of silver, lead, and zinc from Clear Creek County. Though development work and production in Gilpin County have been resumed, the closing of the Argo mill, at Idaho Springs, and of the associated Fremont mine will cause a decrease in the production of gold which can be offset only by increased production at several mines.

At Leadville, the closing of the Iron Silver Mining Co.'s mines and the Greenback mine and the abandonment of the Western Mining Co.'s operations will entail a greatly reduced output of silver and zinc from the district. The cancellation of contracts for manganese to be supplied from this district has resulted in the suspension of the shipments of lead-silver ores from mines at which manganese was a product.

The low price and the lack of market for lead and zinc have resulted in the closing of the Wellington mine, at Breckinridge, and the Eagle mines, at Red Cliff. The snowslides and fire at the Sunnyside mine, at Silverton, have handicapped operations there. The removal of the pumps from the lower levels at Aspen naturally indicates a heavy decrease in the production of silver-lead ores in that district. The shipments of silver ore from Creede have not equaled those of 1918.

Development work is being done in several districts. The silver output of Boulder County may show a small increase and the Camp Bird mine, at Ouray, may resume milling during the year. Development is continuing at many mines that have stopped shipments until the prices of metals increase.

The closing of the Globe smeltery, at Denver, will put an additional burden of freight charges on shippers from Boulder, Clear Creek, and Gilpin counties, who will now ship to Pueblo. Only four lead smelters are now operating in Colorado, none of them at full capacity, and some at less than half capacity.

July Pig-Iron Production

July pig-iron production amounted to 2,428,541 gross tons, or 78,340 tons daily, as compared with 2,114,738 tons, or 70,495 tons a day, in June, according to *Iron Age*. There was a net gain of 39 stacks during the month, 46 being blown in and 7 blown out. The estimated capacity of the 239 furnaces in blast Aug. 1 is 85,635 gross tons, as compared with 200 furnaces, having a capacity of 71,700 tons, active on July 1. Of ferroalloys 14,805 gross tons were made, this rate of production now having held for a full quarter. Output increased 55 per cent in the Wheeling district, 45 in New York, 23 in the Mahoning Valley, 19 in the Pittsburgh district, 13 in the Shenango Valley, and 10 per cent in the Chicago district.

Determination of Magnetite in Matte and Slag

Troubles Caused by Magnetic Oxide—Qualitative Tests of Little Significance—Quantitative Method Has Been Proved To Be Sufficiently Accurate, And It Is Also Rapid

BY F. G. HAWLEY
Chief Chemist International Smelting Co., Miami, Ariz.

MAGNETITE is a common though undesirable constituent of most copper furnace charges. It may originate in the raw ore treated or be formed during some of the smelting operations. As magnetite is chemically rather inert, it does not readily combine with the other elements of the charge, and because of its high melting point it has a tendency to collect in granular particles. As the smelting proceeds, part of it enters the slag, part enters the matte and some of it may collect in rather large pasty masses and float on top of the matte. This prevents a good separation and may be the cause of high slag losses.

A qualitative test for the presence of magnetite in slag is sometimes made by means of a magnet, but such a test is of doubtful significance, as many samples will be quite strongly magnetic though containing little magnetite. Generally the sample will be contaminated with minute particles of iron from the grinding machinery, that adhere so strongly to the particles of slag that the two are attracted to the magnet as one. Other compounds of iron that are quite magnetic are apt to be present, such as particles of matte which are frequently magnetic even when no magnetite is present. Possibly the most reasonable explanation of this is that most matte contains an excess of iron in the form of a solid solution of Fe in FeS.

The following experiment will give some idea of how misleading a test for magnetite by means of a magnet may be: A sample of converter slag known to contain considerable magnetite was ground to pass a 100-mesh sieve, and tested by a small and rather weak permanent magnet. Over 90 per cent was magnetic enough to be removed in this manner. A partial analysis of this slag gave: SiO_2, 23.4 per cent; Al_2O_3, 3.9; Fe, 45.8; Cu, 3.5. It is certain that the SiO_2 would be combined with more than its own weight of FeO to form silicate, so it is obvious that there could not possibly be over 30 to 40 per cent of magnetite present. Its amount was afterward found to be approximately 24 per cent.

A reliable quantitative method for the determination of magnetite in slag or matte would frequently be very useful, but so far as I know no simple method has been published.

Several years ago I devised such a method, and it has been improved and pretty thoroughly tested since, so that now I feel justified in offering it to others who may have occasion to make the determination. Extreme accuracy is not claimed, but I believe it to be capable of giving results that are sufficiently near the truth to be of considerable value in commercial work. Duplicate results will usually check to within 0.1 to 0.2 per cent, but probably the absolute accuracy is not greater than 0.5 to 0.6 per cent. The method is in frequent use at two large copper smelteries and is giving satisfactory results.

It is a well-known fact that when magnetite is dissolved in a strong acid such as HCl it forms one molecule of ferric iron and one molecule of ferrous iron, thus: $Fe_3O_4 + 8\,HCl = Fe_2Cl_6 + Fe\,Cl_2 + 4H_2O$. The formula for the ferric chloride can also be written $2FeCl_3$ but the result is the same, for in either case two items of ferric iron are shown.

It occcurred to me that there was little or no ferric iron present in either matte or slag except that contained in magnetite, and that by determining the amount of ferric iron present a fairly close approximation to the amount of magnetite could be calculated. The presence of metallic iron or matte would interfere, but a way was found to overcome that difficulty.

Probably everyone will concede that there can be no ferric iron in matte except that present as magnetite. It may not be quite so apparent that this must also be the case with slags, but consideration of the following facts has led me to believe that it must be at least approximately true:

At high temperatures the tendency of most chemical combinations is to dissociate and form new compounds in which the elements have lower valances. It is very common to have heat alone act as a reducing agent. Thus at high temperatures, CuO is reduced to Cu_2O, MnO_2 to Mn_3O_4, As_2O_5 to As_2O_3; SO_3 to SO_2, and Fe_2O_3 to Fe_3O_4. Ferrous oxide is a much stronger base than ferric oxide, and at the temperature at which slag forms ferrous silicate is much more stable than ferric silicate. When ferric oxide alone is heated to a very high temperature it is reduced to Fe_3O_4, even when no reducing agent is present, but if silica is mixed with ferric oxide it is further reduced to ferrous oxide, which combines to form ferrous silicate. The presence of lime or alumina does not alter this tendency.

Magnetite itself is a rather stable compound that does not easily react with other substances. It resists both oxidation and reduction better than other iron compounds.

In ordinary furnace practice slags are almost always formed in contact with some reducing agent. In the blast furnace there is carbon, carbon monoxide, sulphur dioxide, and a small amount of sulphide dissolved in the slag, all of which have a reducing action.

In reverberatory smelting the conditions for reduction are not quite so favorable, but there is always sulphur dioxide and the dissolved sulphide present. F. W. Clark[1] quotes Vogt as stating that hematite rarely if ever occurs in furnace slags.

DETERMINATION OF MAGNETITE IN SLAG

The method for determining magnetite, as applied to slag, is as follows: Grind the slag to about 100 mesh and weigh 0.5 to 1 gm. into an Erlenmeyer flask of about 175 cc. capacity. Prepare a mixture of equal parts of concentrated nitric acid and a 15 per cent solution of sodium chlorate in water. Heat this nearly to boiling and add about 20 cc. to the sample in the

[1] "The Data of Geochemistry," 3d ed., p. 347.

flask; shake a little to prevent sticking to the glass and then heat just to boiling; remove and quickly dilute with about 100 cc. of cold water.

The sulphide and metallic iron are now in solution while all but a trace of the magnetite is in the insoluble residue.

Let settle a few minutes and decant through a small filter; wash several times by decantation and also wash filter until free of acid. Add 7 cc. of water to the flask and cover with a platinum dish, or anything else suitable; set on a wire screen placed over a flame and heat to boiling to expel most of the air. Remove the cover an instant and add approximately 10 cc. of a previously prepared mixture of one part hydrofluoric and three parts hydrochloric acid which is mixed in a platinum dish and heated quite hot before using. If much magnetite is present, more hydrochloric acid may be needed. Replace the cover and heat to boiling as quickly as possible; remove the filter that contains the small portion of slag that was filtered out, tear off as much of the clean portion as possible and place the rest, containing the residue, in the flask. Boil until the sample appears to be entirely decomposed and the filter is disintegrated, then add about 5 cc. of a saturated solution of boric acid in warm 50 per cent HCl. While still boiling, titrate with a standard solution of stannous chloride from a burette so placed that the tip is just at the mouth of the flask. The solution is run in rather quickly, with constant shaking, until the yellow color of the ferric chloride can scarcely be seen. At boiling temperature and under the conditions given, the end-point is quite sharp, and there is little difficulty in telling when it is reached.

From the equation $Fe_3O_4 + 8HCl = Fe_2Cl_6 + FeCl_2 + 4H_2O$ it is seen that 2Fe in the ferric state are equivalent to one molecule of Fe_3O_4; therefore the iron value of the stannous chloride solution $\times$ 2.073 = magnetite.

The time required for a determination by this method is not long, and a little practice is all that is needed. After the apparatus is assembled and the solution standardized, one assay can easily be made in 20 minutes and three or four assays may be made in half an hour.

When it is desired to determine magnetite in matte the method is modified as follows: Weigh 0.5 to 1 gm. of matte into a flask as before. Dissolve 3 cc. of bromine in 3 cc. of acetic acid and add to the flask, shake to mix, and let stand about 10 minutes in a warm place. Add cautiously about 20 cc. of the same dilute nitric acid and chlorate solution as used for slag; heat just to boiling and proceed exactly as before. The sulphide of the matte may be dissolved with the chlorate mixture alone without the use of bromine, but the results are more satisfactory when the latter is used. The solvent effect of bromine on magnetite is very slight. The presence of a few flakes of unoxidized sulphur does not seem to have any harmful effect on the determination.

Slag or matte that has weathered on the dump for some time will be oxidized, so it is not advisable to try to determine magnetite by this method on any except fresh samples.

To make the standard solution, dissolve 21 gm. of hydrated stannous chloride ($SnCl_2 . 2H_2O$) in 100 cc. of water + 55 cc. HCl + 5 gm. of tartaric acid, and then dilute quickly to two liters and place in a closed bottle; 1 cc. is equivalent to about 0.005 gm. of Fe.

To minimize as far as possible the oxidation caused by contact with air, the solution should be kept in a five-pint bottle, with the burette permanently attached, so that it can be filled by forcing the solution up through a rubber tube by means of compressed air from a rubber bulb. If it is desired to keep the solution for some time it is well to attach a tube or bottle containing an alkaline solution of pyrogallic acid to the inlet air tube to absorb the oxygen.

To standardize the solution, weigh out 700 mg. of ferrous ammonium sulphate, which contains 100 mg. of Fe, into a small flask; add 15 cc. of water, 7 cc. HCl, and when dissolved add 5 cc. H_2O_2, or enough to oxidize the iron. Set on the hot plate and boil for five minutes to completely decompose the excess H_2O_2. Add a few drops of HF and 5 cc. of H_3BO_3 solution, so that the conditions approximate those of the regular assay; then titrate with the tin solution. It is generally necessary to standardize the solution every day.

Magnetite could be used as the standard, but it should be remembered that most of that found in nature contains considerable titanium, whereas that formed in smelting operations contains but little.

The presence of boric acid is not absolutely necessary, but is beneficial, as it combines with the HF and has a tendency to retard oxidation; it also counteracts the bleaching effect of the HF on the ferric iron and retards the etching of the flask. Of course the HF will attack the flask considerably, but usually one flask will last for 15 to 25 determinations.

Proof of Accuracy of the Method

Following are some tests made to determine the solubility of magnetite in the nitric-acid mixture used to remove sulphides. A sample of nearly pure magnetite was ground to 150 mesh in an agate mortar, and samples were weighed and treated in beakers with the acid for varying lengths of time. The assay was then diluted, filtered and the amount of Fe found in solution.

The acid used was concentrated HNO_3 diluted with an equal volume of a 15 per cent solution of $NaClO_3$ in water.

SOLUBILITY OF MAGNETITE IN NITRIC ACID MIXTURE

	Acid Used	Time Boiled	Magnetite Taken	Magnetite Dissolved
1.	25 cc.	6 min.	500 mg.	22.0 mg.
2.	10 cc.	10 min.	20 mg.	1.5 mg.
3.	10 cc.	1 min.	20 mg.	0.8 mg.
4.	5 cc.	1 min.	20 mg.	0.7 mg.
5.	10 cc. Conc. HNO_3	4 min.	500 mg.	22.0 mg.
6.	5 cc. Conc. HNO_3	10 sec.	500 mg.	2.0 mg.

Another experiment was made on crystallized magnetite found in the walls of a reverberatory furnace, ground to 100 mesh.

EXPERIMENT ON CRYSTALLIZED MAGNETITE

	Acid Used	Time Boiled	Magnetite Taken	Magnetite Dissolved
1.	10 cc. HNO_3 + 15 per cent chlorate	2 min.	500 mg.	5.0 mg.
2.	10 cc. HNO_3 + 15 per cent chlorate	Just boiled	500 mg.	2.0 mg.
3.	10 cc. HNO_3 + 15 per cent chlorate	Just boiled	20 mg.	0.5 mg.
4.	3 cc. HF + 2 cc. H_2O	3 min.	400 mg.	170.0 mg.
5.	3 cc. HF + 2 cc. H_2O	1½ min.	400 mg.	90.0 mg.

From these figures it may be seen that when but little acid is used and it is not boiled long the loss due to solubility is small.

Numerous tests were made to see if any error would be caused by oxidation of the solution of magnetite by the air, either before or during titration, or from any reducing action the filter paper might have. It was found that if the directions were followed no trouble need be feared from either condition.

In order to see how the method would check on

synthetic samples, the following was tried: A sample of slag was selected as free as possible from magnetite and matte, and run in the ordinary way. This gave 0.4 per cent of ferric iron, which is equivalent to about 0.8 per cent of magnetite. Several samples of this slag were weighed out and varying amounts of magnetite added. This magnetite was not pure but contained 97 per cent of Fe_3O_4.

SLAG WITH ADDED MAGNETITE

		Magnetite Found, Per Cent.
1.	1 gm. slag + 0 magnetite	0.7
2.	1 gm. slag + 0 magnetite	0.8
3.	1 gm. slag + 1 per cent magnetite	1.7
4.	1 gm. slag + 2 per cent magnetite	2.9
5.	1 gm. slag + 2 per cent magnetite	3.0
6.	1 gm. slag + 4 per cent magnetite	4.3
7.	1 gm. slag + 4 per cent magnetite	4.6
8.	1 gm. slag + 10 per cent magnetite	10.2

It has already been pointed out that under the conditions of slag formation it would be impossible for any considerable amount of ferric iron, other than that contained in magnetite, to be present. However, it should be remembered that the reactions, in which ferric iron is reduced to ferrous, are reversible and that under these circumstances it might be possible for a normal slag, free from magnetite, to contain a very little ferric iron.

A good many experiments were made in trying to test this point. The experiments, though not absolutely conclusive, seemed to indicate that in most cases there was from 0.3 to 0.7 per cent of ferric iron present, exclusive of that in magnetite.

In one experiment, several samples of slag were ground quite fine in an agate mortar, the magnetic particles removed with a magnet, and then the ferric iron determined in the residue. The most satisfactory way found to remove the magnetite was to place about 10 gm. of the sample in a small porcelain crucible with about 10 cc. of gasoline. The sample was stirred with one pole of a straight-bar electro-magnet, tapped a few times, and the magnetic portion removed. The gasoline was then decanted and the residue dried. By working under gasoline in this manner the tendency of the non-magnetic particles to adhere to the magnetic particles is partly overcome. Tests for ferric iron in the non-magnetic residue gave about 0.4 per cent for blast furnace slags and 0.6 per cent for reverberatory slags.

It was thought desirable to check these figures by a different method, so an attempt was made to decompose the slag without dissolving the magnetite and then to determine the ferric iron in the solution.

Samples of properly chilled slag rather low in magnetite and known to decompose very easily were treated with warm dilute sulphuric acid and a little silver sulphate added, to combine with any H_2S that might be evolved. The solution was then quickly decanted and the ferric iron in both the solution and the residue determined. Of course this method is not very accurate, as with even a short treatment some magnetite will be dissolved. However, some separations seemed fairly good, and these in a general way checked pretty well with those obtained after removing the magnetite with a magnet.

I think there is warrant for assuming that all ferric iron found in matte and nearly all of that in slag is derived from magnetite. Probably there will be present in slag a few tenths of 1 per cent of ferric iron combined as ferric silicate, but, if desired, a deduction can be made for this small amount before calculating the results to magnetite.

The Sources and Uses of Cadmium

The U. S. Geological Survey has recently published a twelve-page pamphlet entitled "Cadmium in 1918," by C. E. Siebenthal, which contains much valuable information on the sources, production, prices and uses of this comparatively rare metal. During the war, cadmium was used as a substitute for tin and nickel to the extent that its production permitted.

Germany and the United States are practically the only producers. No commercial cadmium ores are known. The metal is a byproduct of the zinc industry, practically all spelter containing a fraction of 1 per cent of cadmium, which could be sold as such if the demand warranted. The production of cadmium in this country has never amounted to much over one hundred tons per year, but it could easily be increased to four or five times this figure. Practically none has been imported in recent years. The price at present is about $1.50 per lb., though before the war it was considerably cheaper, selling as low as 53c. in 1909.

Cadmium lowers the melting point of alloys in which it is used, and is therefore employed in making easily fusible alloys and soft solders, such as those used in the fusible plugs of automatic sprinkler systems, boilers, and electric fuses. Cadmium can replace tin in solders, a solder of the composition lead eighty parts, tin ten parts, and cadmium ten parts having much the same properties as one composed of equal parts of lead and tin, and also being somewhat cheaper at present prices. It is suggested that better results can be secured in nickel plating by making the first deposit of cadmium, as it is a better rust preventive than nickel, though it tarnishes more easily. About one-fifth of the production is sold in the form of cadmium sulphide, a brilliant yellow pigment which is unaffected by coal smoke, whereas the common yellow pigments (lead chromes) are blackened in a smoky atmosphere.

Warning Miners Against Dangers

BY A. L. H. STREET

A rule of law governing an employer's liability for injuries to employees is that a worker assumes all risks of injury which are naturally to be appreciated by him, considering his experience and ability to discern the dangers, but that he does not assume risks not appreciated by him because of his inexperience and their latent character.

The United States Circuit Court of Appeals, Eighth Circuit, lately applied this rule in the case of Silva vs. Ozark Smelting & Mining Co., 255 *Federal Reporter*, 821, holding that the danger that an ore chute in a mine might, after becoming clogged, open with such rush as to swallow miners shoveling ore, was such latent peril that a mine operator may be held liable for fatal injury to an inexperienced miner who was not warned against the danger.

However, it was decided by the Utah Supreme Court in another recent case—Macky vs. Bingham New Haven Copper & Gold Mining Corporation, 180 *Pacific Reporter*, 416—that defendant was not bound to warn an experienced miner and timberman of the location of chutes, which did not constitute latent defects, the miner having full opportunity to observe the situation and condition of chutes in the performance of his routine duties which took him to different parts of the mine.

The Care of the Human Machine

Proper Treatment of Injuries Has Resulted in a Reduction of Fatalities—Supplying of Wholesome Food and Proper Care of the Body Aid in the Conservation of Health, and Promote Efficiency

AT A MEETING of the Mining and Metallurgical Society of America on May 1 Dr. Thomas Darlington addressed the members upon the subject, "Man as a Machine." Much that he said is of such deep concern to the mining and metallurgical industry that the following extracts from his address will be of timely interest:

"I am going to talk to you about man as a machine and the necessity of keeping that machine in working order. Medicine has opened a new field, particularly in prevention of disease, and we have begun to consider man in a different light. We know, and have known for a long time, that it pays to take care of an accident, and we know that it costs something every time a man loses his finger. It used to be, even ten years ago, that in some of the steel plants when men became injured the wound would become septic in fully 50 per cent of the cases. Today in various plants, the United States Steel Corporation, Carnegie, Cambria, and Youngstown Sheet & Tube, the rate is only one out of a thousand, and in the Bethlehem Steel much less than that. In the big plant at South Bethlehem in four years of accidents, taking every little injury into consideration, fifty or sixty cases a day, there have been only two cases of septicæmia.

"The deaths in the army, both from disease and those killed in battle, are nothing compared to those who become ill and die in industry.

"And how have we looked upon the man in industry and in the Army, and how have we been treating him? We think that hardship hardens a man, and we look at the brown faces of the men that have come from abroad and say they are 'hard as nails,' but I am thinking of all those that went down, of many deaths, for which there seemed to me to be no necessity. Given a well man, and you have absolute control of him. Why should he get ill?

"From my standpoint, efficiency depends primarily on health. The German philosopher Münsterberg said it depends on a man's psychology, but what does psychology depend upon? Flow of blood to the brain, and flow of blood to the brain varies with all kinds of things, with the weather, the pressure of the barometer. Suppose your liver is out of order. Don't things look with a green and yellow hue? Psychology depends on health. Efficiency depends on health, and it pays to take care of a workman.

"As a matter of fact, illness in industry already has an effect on operating costs that is far from being realized. Whenever a man is absent from his work because of illness, it is usually necessary to have someone else take his place. The substitute, as a rule, is a less efficient worker; he makes a smaller output for the day's wages; he spoils more raw material; he requires more supervision from the foreman, who is thus distracted from more important work; and procuring and sending the substitute to the work needed involves a cost and usually a delay in the operations.

"Efficiency depends on health, and health depends on three things: the care that a man gives himself, the care that industry gives him, and the making and enforcing of health laws—city, state, and national. What can people do for themselves? Before I take up that question it is proper that I state that I have been told some of the members here are interested particularly in the question of fatigue. Fatigue means much to a worker. If a person catches cold it is when he's tired. If you catch an infectious disease it is when you're tired. Fatigue lessens resistance to disease. Fatigue is the one great thing in this world that we want to avoid. What makes people tired? Work? No. Very seldom. It isn't work. Cold will make you tired. It makes every cell in the body work fast. A great many things make fatigue, but seldom work. That is a different idea from that which most workmen have. How do people get tired? Now, to know that, you have got to understand a little physiology. We must understand the body. Every part of the body is in motion all the time. When any part isn't in motion in the body it is dead. You are manufacturing heat; you are getting energy all the time. That comes from your food. Food goes into the body, is taken up and stored in the body, and you have it to use. It is then burned up by means of the oxygen which you breathe. All the time in the body there is a breaking-down process; all the time there is a building-up process.

"Energy depends first upon the food you eat: the kind of food, whether the system can use it or not, whether you digest it and store it away. Next upon the oxygen which is carried by the red blood corpuscles, the hemoglobin in the blood. The first thing, then, in the question of fatigue depends upon the character of the food that people eat. Few persons understand that, and so far as workmen are concerned, few of them or their wives know anything about feeding the man, and any old thing goes in the lunch bucket. One day I opened 250 lunch boxes in a Carnegie Steel plant. The first bucket opened contained a whole boiled cabbage. How much $C_6H_{12}O_6$ did he get to use in the muscle; how much energy could he develop from that cabbage? The next man had nothing but cake and honey. He got all the $C_6H_{12}O_6$, but what did he get to make up for the loss of protein and muscle? Nothing, and he was thin.

Energy and Its Relation to Food

"But it is not alone a question of the kind of food that he gets. Does the man digest that food? Was it mingled with bacteria in the mouth and fermented in the stomach? Did the sugar split up into acids in the stomach before it got into the muscle? Don't you see that energy is the converse of fatigue and fatigue the converse of energy? Energy depends first upon food and its digestion, its absorption and utilization, and next, how are you going to burn it? It is burned with the oxygen. Take a drop of blood from a man and examine it under the microscope and we find that he has a 5,000,000 blood count. Yes, that is a good healthy

man. It is up to normal. The next man we take we find he has 2,500,000 blood count. Doesn't it take twice as rapid the circulation of the 2,500,000 to carry the hemoglobin as with the man with the 5,000,000? Yes, the blood has to work twice as fast because he has anæmia. What does anæmia come from? Dark, unventilated rooms, infectious disease, poor food, lack of movement from the bowels, bacteria in the mouth, in the tonsils.

"Next, getting rid of the ashes of waste. And how do we do it? The blood takes it up and takes it away. If a person drinks a great deal of water, that helps. If you have a shower bath, you drive the blood inside, and then it returns to the surface again, and that helps, and soon you get rid of all fatigue, and the waste goes out through the kidneys. But other waste produces fatigue. In fermentation we have bacteria in the bowels all the time. In fermentation, particularly of protein food, you develop certain poisons. These poisons are known as indol, skatol, mercaptan, and certain phenols. The last develop particularly from eggs and milk. The most common poison found is indol. That is absorbed and becomes a sulphate in the system, and that is known as indican. When you have a urine examination you see so much sugar, so much albumen, and so much indican.

"To show you how it works and how a lack of regularity of the bowels produces fatigue: A man gets up in the morning, and he hurries. He goes to work. He has got a lot to do, and the small amount of liquid material in the lower part of the bowels is absorbed and the desire to evacuate the bowels passes off. The poison is taken up by the blood and permeates all the muscles of the body, and the man becomes tired.

"This has been proved numerous times by injecting indol into the blood of perfectly fresh men, birds and animals, always with the same result, fatigue. The man has only about a little more than one-third the efficiency of the other man, so far as his actual muscular capacity is concerned. If the one man is worth $6 a day, this man is worth $2.30.

The Need for Personal Hygiene

"I said that a man's efficiency depends upon what he can do for himself. Now, among the many things of personal hygiene besides the question of taking baths, care of the eye, the ear and the nose and everything else of that kind, and regulation of a man's meals, there are simple things like the brushing of teeth. How many workmen in the factory brush their teeth every day? To be efficient men they must brush their teeth seven times a day. Do you suppose any of your workmen know that? Not a one of them. Why must they do it? The manufacturer is interested in it because of his output. If I had a factory I'd make every man a present of a toothbrush. It was done in the Army. I helped to take care of fifty thousand men, and had to talk to them. Pneumonia killed some of them, because they didn't brush their teeth. What did they do with the toothbrush? Used it around the edge of the shoes to get the mud out. What is the first thing about the teeth? Well, we need them for enunciation. In the Army it was absolutely necessary that orders should be distinct. The chewing of food means a lot in energy. Still, that means little compared with some of the other things. In the mouth are forty-eight varieties of bacteria. If you chew the food without brushing the teeth you swallow those bacteria, and the food ferments in the stomach, and often it passes the quarantine of the stomach and goes down to the bowels.

"The gastric juice of the stomach will keep indefinitely, but swallow saliva and it quickly spoils from contamination with the bacteria that the saliva carries down. Do you know that in the Army in the grip epidemic few if any died from grip? They all died from pneumonia. Why? There are four types of pneumonia germs. Nearly all died of the fourth type. That is a mouth bacteria. They got the grip, and then the pneumonia bacteria that inhabited their mouth and grew there went into the lungs and killed them. If they had all brushed their teeth regularly, many of them would have lived. Many, very many of the 600,000 persons that died in the United States, would be alive today if they had brushed their teeth in that epidemic. But that is little compared with the other thing. A tooth dies, but you do not always know it. At the root of that tooth there comes a very small abscess. From this, bacteria and the toxin are absorbed in the system. Just the same as in the tonsils. The tonsils and the teeth make over 90 per cent of our infectious disease. The poison may go into the heart, producing vegetation of the valve; or go into the kidneys, and make Bright's disease; or go to the bladder and make inflammation of the gall bladder. Nearly all rheumatism comes from bad teeth.

"Do your workmen know that anæmia, the loss of the red blood corpuscles which carry the oxygen to the tissues, is often due to abscesses at the roots of the teeth or old roots in the mouth? Have you got a dentist in every factory pulling out those old roots? No. The first thing I did at Hog Island where I was consulting surgeon was to put three dentists there.

"Deaths from shock and hemorrhage! Men die in a few minutes from shock, but if you have blood to inject into them right away you often may save them. We hired three men, and gave them $1,200 a year apiece and fattened them up and kept them raking leaves, and when a man got injured we took some blood from them and injected it into the injured person. We saved three men worth $5,000 each according to the Pennsylvania Compensation Law the first month—$15,000 against $300 in the first month!

"How about washing of hands? It is from dirty hands that bacteria get into the mouth. What does the surgeon do? Simply wash his hands? No. He puts on rubber gloves, even after he has put his hands into absolute alcohol with bichloride. Take the case of 'Typhoid Mary.' How did she give typhoid to twenty-eight different families? Because she had typhoid germs on her hands. Very little—but it gave disease. Does every workman wash his hands before he eats lunch?

"There is one thing that workmen generally do not know. The man who does not sweat does not live as long as the worker. To live long you have got to work. Work leads to longevity. The rich man of today, what does he do? Does he do like the man in the Bible who said, 'Now, soul, we will enjoy ourselves and eat, drink and be merry'? The rich man today builds an eighteen-hole golf course and works like the devil to keep his health. Work doesn't hurt anybody.

"That is what we have got to teach the workman.

"We have in the neck a gland called the thyroid. We have more important ones over the top of the kidneys, little thin glands called the adrenals. These are like

the governor on an engine. They control our circulation. If you lose those glands, you die. These adrenals throw out a powerful drug. I know of two men on the front where a big shell burst and adrenaline was thrown out so that every hair stood on end for a week. A grouch, grief, anger, or worry are ruinous to the body. They cause adrenaline to be thrown out. But joy, love, laughter prolong life. What does that mean? It means that we must teach the employee cheerfulness; that every man shall find in his daily work his greatest happiness. Just as God Almighty found happiness in the creation of the earth, we, made in His image, must find our happiness in our daily work, no matter what that work is.

"We now come to another side of it, and that is this: Cain's answer by the Garden of Eden was, 'Am I my brother's keeper?' The Bolshevists and the Socialists have used that for a great while, this cry of the brotherhood of man, which means nothing to that class. When I was in the Department of Health we had 187 laws. They all meant one law. How can you translate them into one law? The man that loves his neighbor won't spit on the sidewalks. He won't sell his neighbor bad food. He won't let smoke come out of his chimney. He won't let his child with contagious disease run around and spread the disease. That is the thing that we must teach workmen—the love of their neighbors. It is a great thing to relieve suffering. It is a far greater thing to relieve penury and crime, so we can say with Abou Ben Adhem, 'Write me as one who loves his fellow men.' "

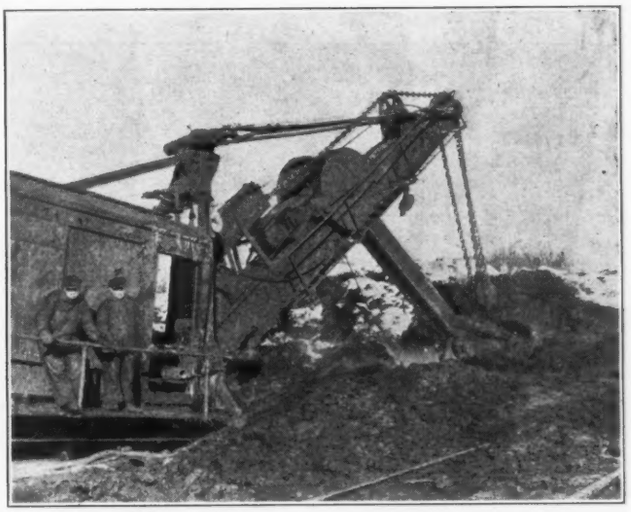
Steam-Shoveling Muskeg

The illustration shows a condition that was encountered last winter in Minnesota on the Mesabi Iron Range during the process of removing the overburden from the orebody of one of the large iron-mining properties. The material which the steam shovel is digging is muskeg, or swamp land, and, as will be noted, the removal of this material is effected only with difficulty, owing to its tendency to spread and the fact that its consistency is such that the surface gives little support to any weight placed upon it.

Under severe weather conditions the frost in Northern Minnesota extends from three to eight feet below surface, and though this condition is a detriment in the stripping of the ordinary overburden, which consists mainly of glacial till, it is of some advantage in the removal of muskeg. The frost, however, is of little consequence after the first cut is taken, and it is necessary to keep the steam-shovel tracks blocked up to prevent settling of the shovel in the mud which soon forms in the bottom of the cut. The shovel tracks in this instance are entirely embedded in the mud, and though the digging bank shows a solid appearance, the underlying material is wet and swampy.

The steam shovel shown is known as Model 91, weighing about 120 tons, and is the type generally used in Mesabi Range stripping operations, as well as for loading the iron ore after it has been uncovered. During the last three years a larger type, weighing 360 tons and known as Model 300, has been adopted to some extent in stripping work.

In the foreground will be seen the loading tracks that carry the dump cars into which the material loaded by the shovel is placed. It cannot be said that the alignment of the tracks is maintained, for a similar "sinking" results after a time, although not to such a degree as that which effects the steam-shovel tracks. The steam shovel is equipped with adequate safety devices, in accordance with standards adopted by many of the mining companies in that section. Guard rails



STEAM SHOVEL OPERATING UNDER DIFFICULTIES

extend along the running boards on either side, as well as along the ladders on the boom. All the running gears are substantially protected, and, where possible, the movable parts are covered. A short cable extends from the top of the "A" frame to the top of the boom, and this arrangement prevents the dropping of the latter in case the "hog rods" or supporting members of the boom should break. The steam-shovel dipper has a capacity of 3 cu.yd., and the material is loaded into dump cars of 12-cu.yd. capacity.

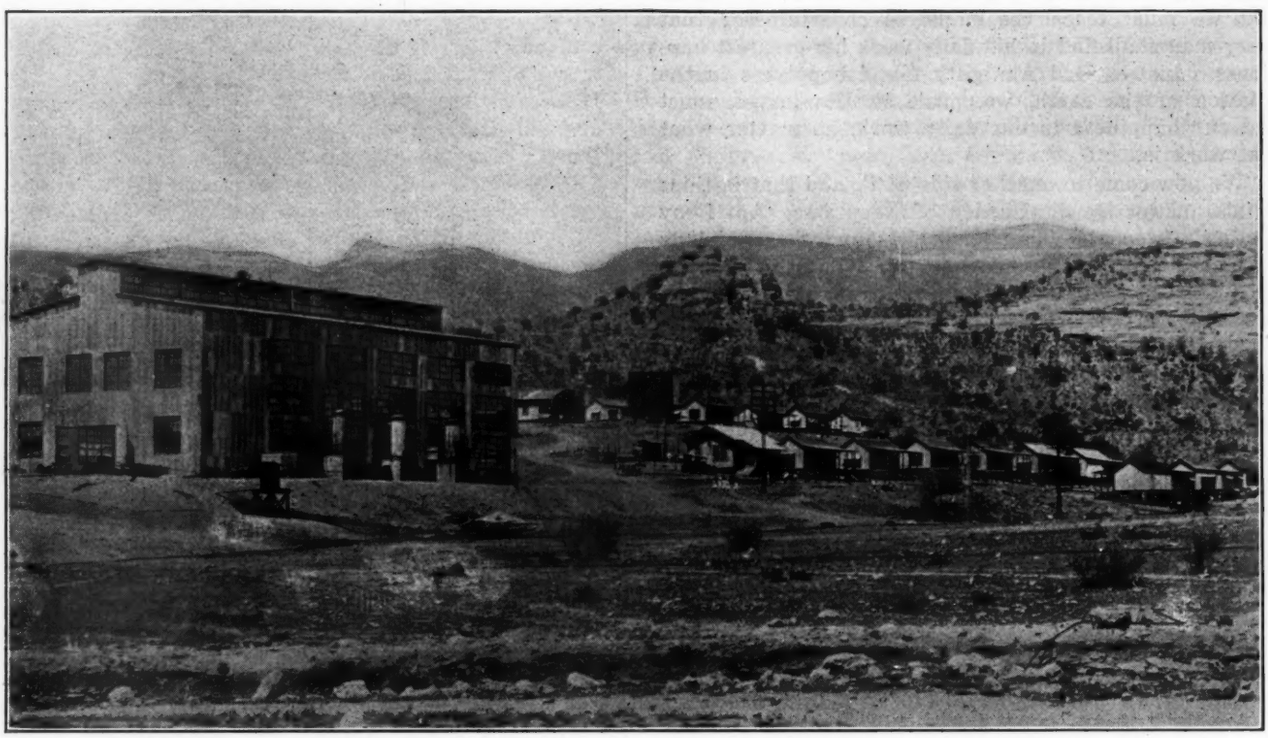
Annual Report of the Buffalo Mines Co.

The thirteenth annual report of the Buffalo Mines Co. for the year ended Apr. 30, 1919, shows that the mill treated 28,572 tons of ore from the mine, 2,000 tons from stockpiles, and 77,239 tons of sand tailing. The total production of silver, including ore and bullion, amounted to 625,786 oz. There are 17,607 tons of broken ore in the mine carrying approximately 11 oz. silver per ton, and 3,000 tons of doubtful grade. Two additional bodies of a better grade of ore were opened, which will assure the steady operation of the mill during the coming year. About 33,000 tons of sand tailing averaging 6.5 oz. silver remain for further treatment.

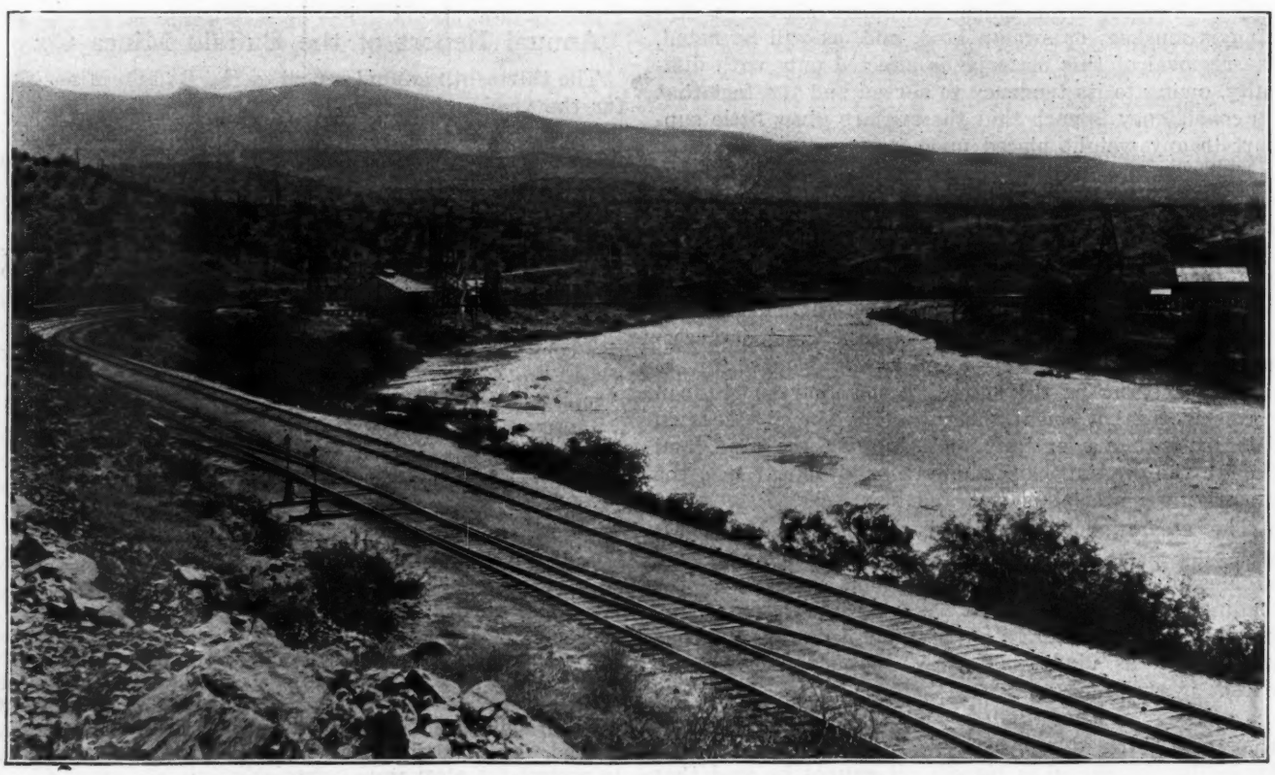
The revenue from the sale of ore containing 794,531 oz. of silver was $802,426, and from the sale of bullion containing 9,206 oz. of silver, $9,236. The value of ore and bullion on hand on Apr. 30, 1919, was $288,700, as against $441,872 on Apr. 30, 1918.

That a Small Percentage of Copper in basic open-hearth steel tends to prevent corrosion was shown by D. M. Buck in a paper entitled "The Influence of Very Low Percentages of Copper in Retarding the Corrosion of Steel," presented at the Atlantic City meeting of the American Society for Testing Materials. Copper to the extent of 0.12 per cent is said to be sufficient to neutralize the influence of 0.055 per cent sulphur. Even if the sulphur is much higher than normal, copper to the amount of 0.15 per cent is sufficient to protect the steel from corrosion.

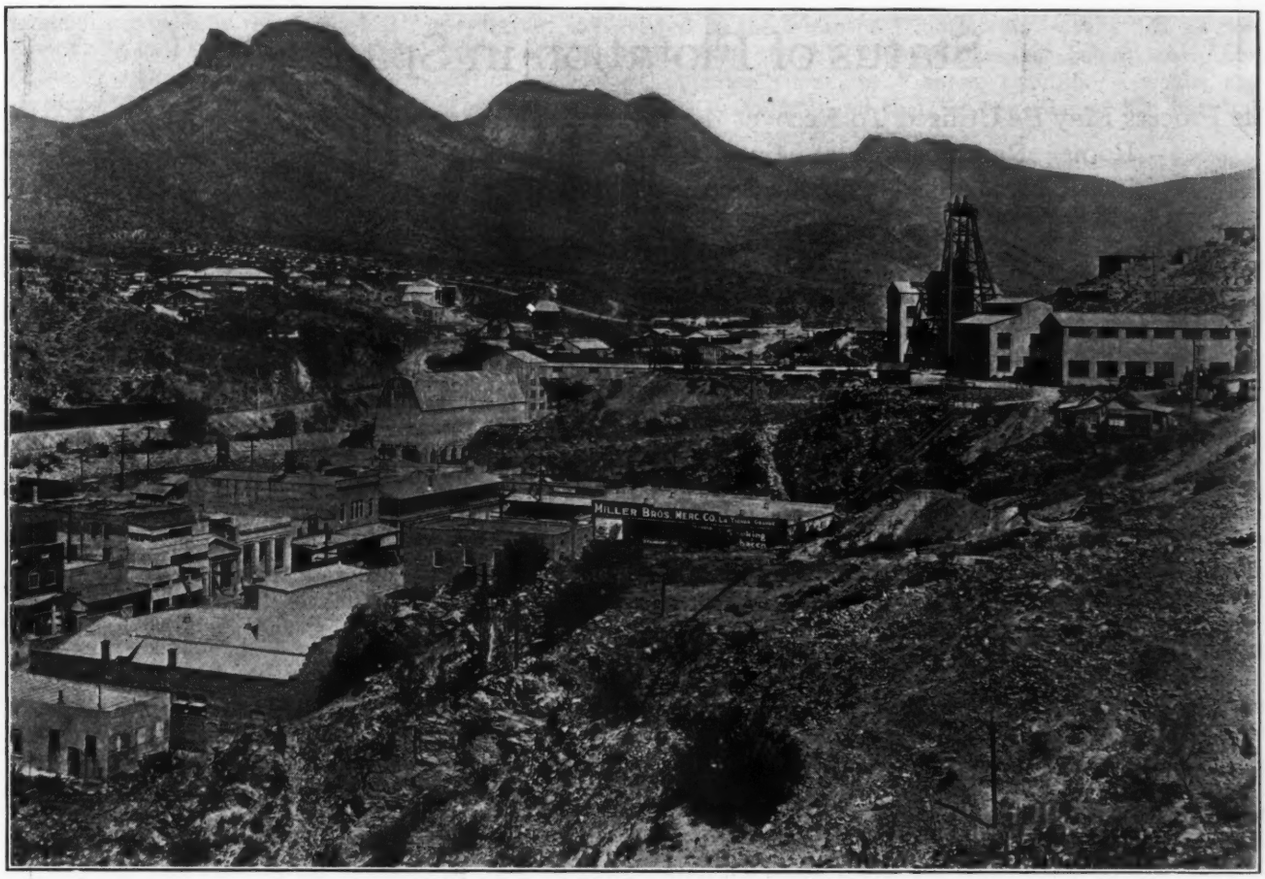
Arizona Hercules Copper Co.



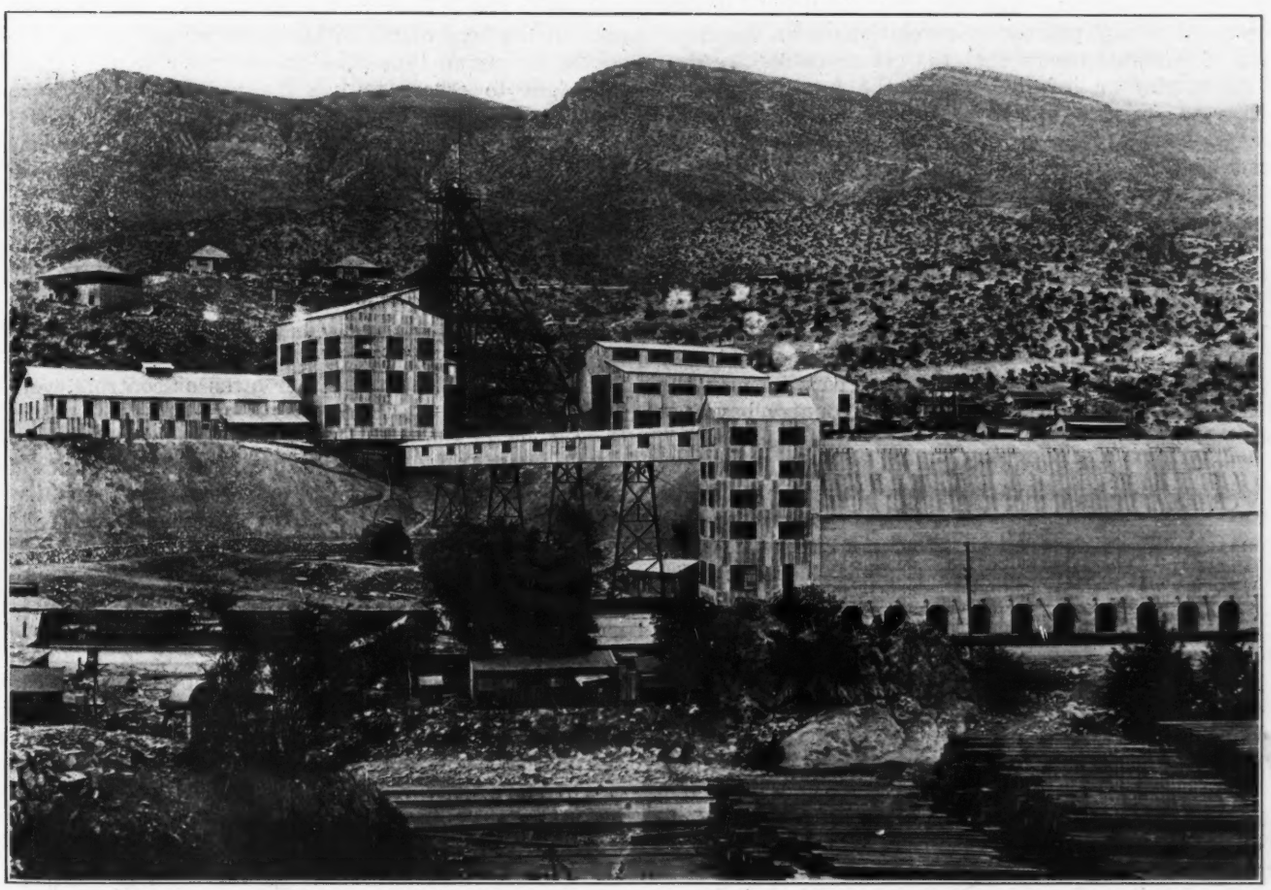
POWER HOUSE OF ARIZONA HERCULES COPPER CO. AND PART OF THE TOWN OF HERCULES, ARIZ.



SUSPENSION BRIDGE ACROSS GILA RIVER. A 420-FT. SPAN CARRYING A 10-IN. PIPE LINE



TOWN OF RAY. ARIZONA HERCULES AT RIGHT, RAY CONSOLIDATED NO. 2 PLANT IN BACKGROUND



COARSE-CRUSHING PLANT, HEADFRAME, HOIST HOUSE AND MACHINE SHOP AT ARIZONA HERCULES

Status of Flotation in Spain

The Process May Be Utilized To Recover the Mineral Content of Dumps Dating Back to Early Rome—Ramifications of Minerals Separation in the Future Development Of the Spanish Metal Industry

MADRID CORRESPONDENCE

MINING engineers in Spain have reached the conclusion that it is no longer possible to concentrate low-grade ores by older processes in competition with ores concentrated by flotation, owing to the lower cost by flotation and to the higher percentage of recovery obtained by that method. It had been observed by these engineers that today the bulk of the copper and lead concentrates produced in the United States is derived from plants using the flotation process. They are informed regarding the practices in the important lead-producing plants of southeast Missouri, Idaho, and other centers of large production, and the large copper producers, such as the Utah Copper Co., in Utah, the Nevada Consolidated at Ely, Nev.; the Miami, the Inspiration, and the Ray, in Arizona; the Chino, and the Burro Mountain, in New Mexico, and many more.

It has been observed that, almost without exception, the great mineral producers have denied the validity of the patents of the Minerals Separation Co., for reasons that are a matter of court record and of general knowledge. The opinion is freely expressed here that the resistance from the metal producers would not have risen had the terms of the Minerals Separation Co. been more generous. However, it is admitted that the discovery of any process so revolutionary as the flotation of minerals means that the old processes are destined to play an inferior role in the future, and that either the process will be used by the world at large, as was done in the case of the cyanide process for extracting gold, or the mineral industry must become in effect a monopoly controlled by the owners of the patents, until the patents have expired.

For some reason the flotation process has not hitherto been used in Spain, although it is covered by Spanish patents, obtained by British subjects, the same as those who patented the process in the United States. The Spanish mining engineers have not had an opportunity to see the process in operation, and consequently the great possibilities for its use in this country have not been improved.

The large low-grade deposits of minerals, especially of copper and lead, invariably constitute the most dependable source of supply of those metals for any country. The richer deposits, that can be smelted without concentration, are usually of limited extent. The permanence of pyritic copper mining in the Province of Huelva depends on the facts that the ores are exceptionally free from silica, the sulphur can be burned off and used in making sulphuric acid, the copper can be extracted from the calcine, and the residual iron tailing may be used for smelting. These conditions are exceptional.

The quantity of low-grade ores in Spain is far in excess of the ores that are available for smelting direct. In so far as concentration is applied it is of the old sort, and to a large extent is limited to the use of Cornish jigs of antiquated design, and in less degree to various forms of table concentrators. Large deposits of low-grade lead ore are available, most of which contain above 10 oz. of silver per ton, and there are also important deposits of copper ores suitable for concentration by a cheap process, such as the flotation method patented by the Minerals Separation company's staff. Furthermore, there are numerous dumps in many districts, that have accumlated from mining operations dating back to the time of the Romans, and in some cases to the era of Punic control. The tonnage in dumps of low-grade ore and tailing in the Cartagena district is amazing. Much of this material could be economically treated by the flotation process, but not otherwise.

It is reported that a contract has just been signed between the Sociedad Minera y Metallurgica de Peñarroya and the Minerals Separation, Ltd., of London, whereby the Peñarroya becomes the sole owner of the patents in Spain. The Peñarroya has organized a separate corporation for the development of the flotation business, and the Minerals Separation, Ltd., has taken stock in this new company for at least part pay for the rights assigned. At present no outside parties can contract with the Peñarroya for the right to use the process, but the head of the Peñarroya company in Spain is quoted as saying that later the company would extend the right to others to use the process under terms which had not yet been decided upon by the board of directors. It is evident that the Peñarroya company regards itself as being in control of the situation, and it is thought that this means that those controlling that corporation will give the right only to operators who will contract with them for the smelting of the concentrate produced.

The Peñarroya company is in even more absolute control of the lead industry in Spain than is the American Smelting & Refining Co. in control of the industry in the United States. It either owns or controls every lead smeltery in the kingdom. It is impossible to ship the ore out of the country in any considerable amount, owing to the distance of most of the mines from the sea. Accordingly, the lead-ore producers are subject to the demands of the Peñarroya lead trust, and though data are not available concerning the terms exacted, it may be recorded that popular opinion is exceedingly antagonistic. It is perhaps more bitter in its condemnation of the smelter trust than is the Western miner in the United States.

There are two sides to these squabbles between the ore shippers and the smelters, and it often happens that the criticism of the smelter is unjust, and his demands and "rake-offs" are exaggerated. Nevertheless, it must not be overlooked that the Peñarroya is absolute in its control of every avenue to market for the independent lead producer. The acquisition of the flotation patents enables it to insure its control, for the life of those patents, over concentrate as well as ore.

The small producer is thus placed at the mercy of this company. A large enterprise backed by abundant capital, seeing opportunities in the development of the lead and copper industry based upon the large low-grade deposits and dumps, might undertake to follow the example of the producers in the United States, and contest the validity of the patents in the courts.

The Peñarroya company is reported to have produced lead exclusively for the Allies during the period of the war. This was natural, as it is a French corporation, controlled by the Rothschild interests in Paris. It is closely associated in Spain with the banking house of Bauer. This is said to be Swiss, but with German leanings. However, there would seem to be doubt as to the accuracy of this report, from the fact that there has been no evidence of a rapprochement between the Peñarroya and the German owners of the Spanish mines. The Germans own the famous mine at La Carolina, near Linares, known as El Guindo, which is reported to be the largest lead mine in Spain. It has at the present time ore reserves, blocked ahead of production, amounting to over 200,000 tons. This refers to smelting, and not to concentrating ores. The Guindo organization has been backed by the Banco de Urquijo, a great private bank belonging to the Marqued de Urquijo, of Bilbao, with branches in Madrid and elsewhere. It must be noted, in passing, that this house, though accused of Teutonic leanings, advanced large sums of money during the war to facilitate American purchases in Spain for shipment to France.

A prominent Spaniard is quoted as saying, "Urquijo is in business to make money, regardless whether it comes from the United States, or Germany, or any other country." It is reported that recently Urquijo has been extending credits in considerable sums for the purchase of lead mines in Spain, and it is also said that the arrangement is with the old ring that engineered the Metallgesellschaft of Frankfort-am-Main. The object of the Germans is said to be to get underneath of the Peñarroya. This seems hopeless, especially now that the Peñarroya has acquired the flotation patents, unless the Germans contemplate attacking the validity of these patents.

The Peñarroya possesses a further advantage in the fact that the house of Bauer, which represents the same capitalistic interests, owns the railroads popularly known as the "Ferrocarril de Mediodia," from Madrid south and throughout a large part of Andalucia. Thus these allied railroad interests cover the great mineral districts that are tributary to the smeltery of Peñarroya. One of these smelteries is in the town of Peñarroya, one in Linares, and two are at Cartagena. Superior facilities are thus offered for the movement of ores, coal and coke. The Peñarroya owns coal mines, and is active in securing additional coal territory in the south. It has extensive batteries of byproduct coke ovens, and manufactures these byproducts at its works at Peñarroya.

It is of interest to note that the house of Bauer is the owner of the contract with the Spanish government for the sale of the quicksilver output of the great mines at Alamaden. It will be seen, therefore, that the Rothschilds are strongly entrenched in the mineral industry in Spain.

It has been reported that the Marquéz de Aldama and his friends have been the actual backers of the Cia. Minera el Guindo, but that they have been closely related to the house of Urquijo. It is regarded as certain that the latter house has just bought the "Los Quinientos" mine, at Linares, that the Germans are there in control, and that the same house has negotiations pending for other mines.

It may be of interest to note that the smeltery owned by the Peñarroya company at Linares is called the "Société Anciennes de Sopwith," though at Cartagena the smelteries that are operating are merely associated by contract with the trust. One of these belongs to a man named Enthoven, and the other, situated at Portman, near Cartagena, is owned by Miguel opata.

The annual production of pig lead by the Peñarroya company ranges from 140,000 to 150,000 metric tons (154,000 to 165,000 avoirdupois tons). At the present time the market is so dead that the company has 40,000 metric tons of pig lead in store. Nevertheless, the smelters are still receiving ore under contracts with shippers. For lack of any other outlet for its product, the Cia. Minera el Guindo is shipping to the Peñarroya.

The Peñarroya company has contracted with Bradley, Bruff & Labarthe, of San Francisco, Cal., for a new large smeltery to be erected at Peñarroya. Mr. Labarthe has been given full authority as engineer and purchasing agent to specify and contract for the necessary equipment. The design is rapidly nearing completion, and it is expected that the erection of the plant will begin early next year, and that the smeltery will be ready for operation early in 1921.

The Cleaning of Manganese Ore

The U. S. Bureau of Mines has just issued a mimeographed bulletin on the "Preparation of Manganese Ore," by W. R. Crane. As is well known, the production of manganese in this country was considerably stimulated during the war, many small companies beginning operations in the Virginia, Georgia, Arkansas, Montana, and other fields. Practically all of these companies went into the business without expert advice, merely following the practice of others in the district, which was usually bad. For this reason the Government sent engineers into the various manganese districts to assist the operators in the proper mining and treatment of their ores. Mr. Crane's paper presents outlines of the methods used in the various districts, pointing out their bad features and suggesting an improved flow sheet for the washing and jigging operations commonly employed.

The ores are ordinarily treated by some combination of grizzlies, log washers, screens, picking belts, and jigs. The chief fault found with the general practice was in the lack of proper screening, which gave the jigs an unsized product that could not be handled efficiently. Mr. Crane points the way to the proper operation of the jigs, going into considerable detail regarding the correct proportioning of the various units in his model plant as influenced by various conditions.

Though most of the manganese producers have sought greener fields since the war ended, the work done in an effort to improve the practice will prove valuable should conditions be more favorable to the domestic industry. It may be some time before Russia resumes her place as the leading producer, but the deposits of India, and to a lesser extent of Brazil, have been proved to be of considerable commercial importance and will doubtless contribute a large part of the world's supply.

Civic Duties and Opportunities of the Engineer*

Advisability of Utilizing the Services of Engineers in Public Affairs—The Value of Scientific Societies to the Government—Functions of the Engineer in Modern Business—Status of Engineering as a Profession

By HOWARD C. PARMELEE

ONE of the fundamentals in advertising is that if you say a thing often enough, you will not only convince all who hear you, but ultimately you will believe it yourself. It is on some such principle as this that I propose to discuss a subject that has been the theme for many presidential addresses during the year, hoping always that if the world is told often enough of the need for engineers in civil and political life, the people will be convinced, and engineers themselves will finally believe it.

Human experience has shown clearly that there are compensations for many incidents which in themselves seem wholly disastrous and without recompense; and so it is that out of the admitted cataclysm of war which has engulfed the world has come a definite demand for engineers, a keener appreciation of their service, and a belated recognition of their need in business and government. I have reason to believe that this recognition is a world-wide as well as a voluntary tribute, and that it offers the engineer an advantage which he must grasp if he would retain it. Had he the tradition or the training of the lawyer, he would not only accept this position of eminence from those who are willing to accord it, but would exercise his gift of speech to persuade the remainder that no mistake would be made in committing to his care the conduct of the world's affairs. But our engineer has been so unused to the limelight that he is likely to shrink from the public gaze and retire modestly to his laboratory or works. Being the lineal descendant of the artisan, and having long been accepted in the public mind as a glorified mechanic, he will be apt to retire all too readily to the background. He needs, as never before, the support and encouragement of the professional society to give him that solidarity and community of interest which will enable him to stamp his influence on the affairs of the world.

I think we may justly claim to have established a profession of engineering, although some may contend that we still have merely a "procession of engineers." By definition, a profession is that calling or occupation which one professes to understand, a vocation in which a professed knowledge of some department of science or learning is used by its practical application to the affairs of others. Formerly, theology, law and medicine were specifically known as "the professions," but I think we may fairly claim to have established engineering on a more solid and scientific basis than any of them. Theology has been almost wholly speculative, the law technical, and medicine empirical. Each has been irrational, and all have gained prestige by claiming it.

On the score of service to humanity, also, I think that engineering may fairly claim professional standing. The achievements of engineers in all parts of the globe are accepted evidence of their ability, but tradition causes us to halt at this recognition, as though the only field in which an engineer could accomplish anything was in the design and construction of some great work. Such things are well enough in themselves, but in the meantime the affairs of business and government are left to men of limited training and narrow vision, and those things which are fundamental in our national life are suffering from the lack of vital direction, which engineers could give.

We have sometimes heard it said of an individual that "he may be a good engineer, but he is no business man.' I resent the implied difference. An engineer is a manager, one who carries a project to conclusion in an efficient manner. I might consent to such a statement as "he is a good mathematician, but no business man," or "he is a good surveyor, or assayer, but no business man," but I must contend that if he is a good engineer, he will be a business man. The war has brought out few more striking incidents of management than the direction of the commission for relief in Belgium by Herbert C. Hoover, an engineer of technical achievement in his profession. This commission handled until near the close of 1916, $227,000,000 worth of supplies, keeping alive a population of 9,000,000 and operating with an overhead expense of but three-quarters of 1 per cent of the gross cost. Such is engineering efficiency in business, organized in an emergency, and administered under constant stress. What might such ability accomplish applied under the normal conditions of business, with ample time for planning and execution?

The engineer is entitled to recognition not only as a producer but as a director of policy. Hitherto he has accepted the responsibilities of operation and production, while the control of the enterprise was in the hands of a banker or merchant. Under these conditions, the work of the engineer might be ever so efficient, and yet the enterprise might fail through ignorant management in the executive or selling department. Complete control on the part of the engineer might avoid such a catastrophe and relieve himself, as well as his associates, of inevitable embarrassment. I think that engineers are coming to demand this form of control, being willing to accept responsibility if they are also given authority. Any form of dual control, with the responsibility still resting on the engineer, is intolerable.

The modern engineer can bring to bear on business all of the general essentials to success. Organization is his forte and management his specialty. With him the handling of men and supplies is a matter of scientific procedure and the keeping of accounts and unit costs a prime necessity. Plainly the ability of such a man should not be confined wholly to the details of operation or production, but should be requisitioned on the board of directors or the executive committee.

Perhaps it is more in the realm of government of

*President's address at the annual meeting of the Colorado Scientific Society, Dec. 6, 1916. Because of the Government's request to conserve paper, the address was not published until June, 1919.

civic and political activity that the engineer is yet to receive his highest recognition. Certainly it is in this field that he must strive most earnestly for a hearing and for a chance to apply his methods. The strongest traditions are against him, and he is handicapped by a lack of familiarity or intimate relation with political organizations. There is no question, however, that his ability, viewpoint, and methods are sadly needed. Accustomed to considering propositions on their merit, and having an abhorrence of waste and inefficiency, he would be less likely to yield to political expediency in matters of great consequence. I doubt if "pork barrels" would appeal to engineers having ethical standards as high as our statesmen would probably assume for themselves. The latter may be good business men in this case, but certainly not good engineers.

There is probably a growing demand for fewer lawyers and more engineers in our civic and political life. There has never been a time in our national history when technical and engineering advice was more needed in matters affecting our industrial growth and welfare. The intricacies of the dyestuff tariff, for example, could not be reckoned with intelligently by lawyers and merchants, nor can the revision of the mining law be sanely undertaken by men who merely own stock in mining companies.

Popular impression prevails that governmental departments are not on an efficient basis, and engineers can render a service to the country by expressing that opinion in a manner so forceful as to show Congress the light.

In matters more vital to the mining and metallurgical industry, Congress has acted with even less discretion. The proposed tax on copper, for the purpose of raising revenue, was a case in point showing how illogically and superficially a profound subject may be approached. Apparently sensing a popular impression that copper was a highly profitable constituent of war munitions, and without first establishing a broad fundamental economic basis for raising revenue in an equitable manner, Congress singled out copper for taxation and gave itself over to class legislation of the wildest sort. Such unfair taxation as was proposed in the case of copper can be charged only to a profound ignorance of conditions. I have no doubt that instances might be multiplied to prove political inadequacy in dealing with technical affairs and showing the need of engineering advice.

One of the finest examples of national service on the part of engineers and technically trained men is the Naval Consulting Board. Through its numerous committees it has attacked fundamental problems of research, gathered technical data on the country's resources, and stimulated interest in the nation's welfare. Another instance is the Public Relations Committee of the American Electrochemical Society. This is composed of its past presidents and is organized for the purpose of advising with Government officials and expressing an interest in various public problems. Through this medium the electrochemists and electrometallurgists exert their influence on such national problems as the development of hydro-electric power and the fixation of atmospheric nitrogen.

To what extent this voluntary public service can be carried depends wholly on the results obtained and the reception which it is accorded. Ultimately it should arouse a demand for that kind of service and result in bringing more experienced engineers into public life. The good example thus set should be followed in state and municipal governments also. Our legislatures and city councils are no less in need of engineering advice than is Congress, while state and municipal affairs generally are subject to abuse and need correction. Town planning and management are engineering problems of first rank, wholly beyond the scope of politics and above the grasp of politicians. Numerous departments of government depend upon technical direction for their successful operation and for the economic handling of funds. In such things engineers should not only take an active part, but should advise those in authority.

Some attention also may be profitably turned to the daily press of this country. There is no more potent force in spreading information or creating public opinion. In technical and engineering matters, however, it is woefully ignorant and in need of sound advice. If we could encourage the editors of our dailies to consult with engineers and scientists on pertinent topics before publishing their dispatches or writing their editorials we would prevent the dissemination of a lot of things that are not so and avoid the ridicule which inevitably is heaped upon newspaper science.

I admit there are other things wrong with our newspapers, which engineers cannot correct, and I am not recommending that engineers become editors of our dailies, for I doubt if we would have much in the way of newspapers under such direction; but I do think it is possible to encourage a closer co-operation between newspapers and engineering of scientific societies, so that the public would get more exact information on technical matters.

Some of the most important civic problems which the engineer will have to solve in the future are more human in their aspect and concern the conservation and distribution of labor. Miss Frances E. Kellor, assistant to the chairman of the Immigration Committee in the Chamber of Commerce in the United States of America, believes that this is one of the great industrial problems of the day and that it will be solved only by the application of engineering methods. Writing on the subject of "Engineers and the New Nationalism," in the *Engineering Record*, she states that the stabilizing of the labor supply is of the utmost importance. "The average labor turnover in the United States is about 200 per cent in the industries upon which America must depend in time of war; in other words, for every 100 men kept at work, 300 are employed. This is a sheer waste of men due to lack of combination in the regularizing of industry and employment of men. In the past we have relied upon the economist and the professor to tell us about unemployment, irregularity of work, vocational education, and similar industrial questions. The laboratory for study has been the employment agency and the lodging house, and the remedy—a law. In the future it will be the engineer who studies the problem in the plant, and the remedy will be the adoption of measures within the industry itself, which will make laws as unnecessary as they are useless to deal with such questions. . . When the engineer grapples with the problem of distribution he will give us a structure on which men can and will travel to work best suited to their needs."

If I have outlined a more or less ideal state of affairs, I do not wish to be understood as anticipating a sudden or immediate realization of my hopes. There

are, nevertheless, many indications that the public duties of engineers are being appreciated by the profession and that the faithful discharge of these duties will open the way to new opportunities. Finally, with a public conscience quickened by the failure of political government to give us a conservative and efficient management of public affairs, a demand will arise for engineering methods, if not for engineers.

Slitting and Perforating Pipes by the Oxy-Acetylene Process

The accompanying photograph (Fig. 1) shows an improvised washing device suspended above a rocking screen. The material being screened passes to the left and the streams of water are inclined slightly to the right; that is, they tend to retard the movement of the material on the screen. The novel feature is the manner in which the openings were cut in the pipe by means of an Oxweld cutting blowpipe. The slits were cut crosswise on the bottom and slightly inclined to the axis of the pipe (Fig. 2). The pipe is 2½ in. in diameter and the slits are about the same length, that is, they extend about one-third around the circumference. The slits in the front pipe were spaced six inches apart and those in the back one, twelve inches apart. The object of this was to determine which spacing gave the best results. It required approximately one-half hour to cut all of these slots, about a dozen in number, by means of the blowpipe. The value of the gases consumed was negligible, probably amounting to less than twenty-five cents. Four to five hours would have been required to do the same work with a hacksaw.

This application of the blowpipe suggests its use for cutting all sorts of perforations in pipes that might be difficult and expensive to accomplish by drilling and sawing methods, and particularly for experimental and emergency applications. For instance, in washing screenings and concentrates it

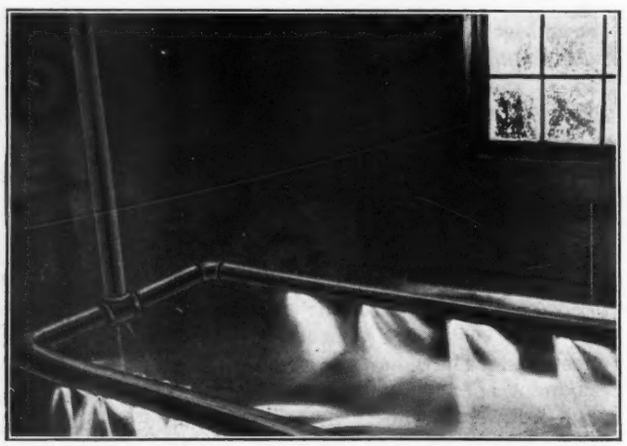
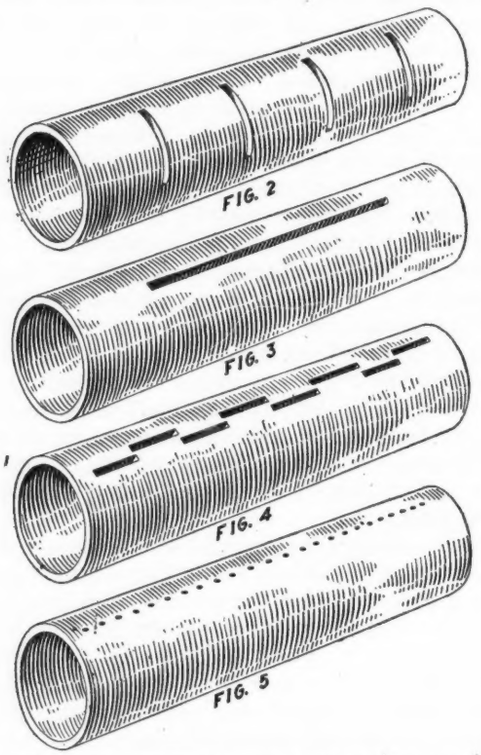


FIG. 1. WASH-WATER SUPPLY PIPE WITH WATER JETS ISSUING THROUGH SLOTS CUT WITH THE OXY-ACETYLENE BLOWPIPE

might be advisable under certain circumstances to run the wash-water pipes across the screen instead of lengthwise. In that case the slits could be cut as in Fig. 3, or staggered, as in Fig. 4, or perhaps circular perforations, as shown in Fig. 5, would give still better results. It is an easy matter to experiment with different arrangements, to determine the most satisfactory method. The perforations in pipes supplying compressed air for agitating purposes may also be cut in the same manner to advantage. The holes would be sufficiently true in shape for most practical purposes, but if an absolutely perfect circular shape is desired, it could be easily obtained by applying a drift after cutting. The shapes of the streams of water in Fig. 1 demonstrate the excellence of the blowpipe as a cutting tool. The slight irregularities that appear in the stream forms are largely due to particles deposited from the water.



MANNER OF PERFORATING AND SLITTING PIPE

In making up coils or networks of piping for any of the purposes mentioned above, oxy-acetylene welding may be applied to advantage for joining the pipe sections, thus eliminating all trouble from leakage or loosening that is so common with screwed or flanged joints. Certain types of damaged or worn screens may also be easily repaired by welding in a new metal patch and cutting holes in it to correspond with the rest of the screen perforations.

Use Cone Classifiers To Build Tailing Dam

For building a tailing dam, 1,150 ft. long, the Old Dominion Copper Co., Globe, Ariz., is using twelve Allen cones. After this stretch has been completed, a second "lift" of 10 ft. will be added, which will give storage for several years. In this work the cones are placed 15 ft. apart so that 200 lin. ft. of dam is built without moving. It requires sixteen hours to move the cones to the new position and to make the necessary connection. The sand removed by the cones, although very fine, packs well, and the dam is stable.

Considerable economy is claimed for this method of dam building, the saving in cost over the old method of team and scraper amounting to several thousand dollars.

CORRESPONDENCE AND DISCUSSION

Letters From the Mining and Metallurgical Industry Dealing With Pertinent Subjects of Interest

The American Quicksilver Industry

In a letter published in the *Journal* of July 5, F. F. Sharpless, discussing the future of the quicksilver industry in the United States, suggests some questions which demand careful consideration by those who will finally decide the future of this industry. Whether all protection is to be abandoned and the industry left at the mercy of European monopoly, or sufficient protection accorded so that it will remain alive, is, in my opinion, important enough to justify thorough discussion, and I shall try to answer concisely the questions raised by Mr. Sharpless.

First: "Is the statement correct that the average ore mined in the United States during the year 1918 contained only five pounds of mercury per ton?" As the report for the year 1918 of the U. S. Geological Survey is not yet published, no official data are available regarding this point. At the conference of producers and consumers of quicksilver held by the U. S. Tariff Commission at San Francisco on June 26, 1918, the ore recovery of some California mines was given as 5 lb., and even lower, per ton of ore. However, it must be taken into consideration that the lower extraction per ton during the last ten years is due largely to the higher prices for the metal, which rendered the handling of the lower-grade ore possible. The following table shows a higher extraction than mentioned by Mr. Sharpless:

TABLE I. POUNDS OF QUICKSILVER RECOVERED PER TON OF ORE TREATED*a*

Year	United States	California
1910	11.7	10.3
1911	11.5	10.8
1912	12.1	11.0
1913	11.1	9.8
1914	10.1	8.3
1915	9.9	8.3
1916	9.0	7.6
1917	9.6	6.7

a U. S. Geological Survey.

Second: "Is it possible to continue to produce in this country approximately its normal consumption of mercury without a protective tariff that will be an actual burden on the consumer?" The yearly consumption for industrial uses can be averaged at about 22,000 flasks. The yearly production before the war was generally not far below that figure (See Table II).

TABLE II. PRODUCTION AND IMPORT OF QUICKSILVER IN FLASKS *a*

	Production		Imports	
Year	Flasks	Value per Flask in San Francisco	Flasks	Value per Flask
1910	20,601	$46.51	9.00	$42.855
1911	21,256	46.01	6,292.60	39.950
1912	25,064	42.05	1,102.75	36.200
1913	20,213	40.23	2,288.70	32.930
1914	16,548	43.92(*b*)	8,198.25	34.175
1915	21,033	85.80	5,625.12	50.265
1916	29,932	125.89	5,657.25	91.195
1917	36,159	105.32	5,206.60	84.515

a U. S. Geological Survey. Import duty to 1913, $5.25 per flask, thereafter 10 per cent *ad valorem*.
b Average of $38.89, value per flask the first half of the year, and $48.94 during the second half.

Even at the present low recovery, the quicksilver operators who have their properties in efficient condition can produce at the present market price, $85 to $100 per flask, with some profit. The high cost of operation is due much more to the decrease in the purchasing power of the dollar than to the lower figure of recovery. Leaving depletion out of consideration, labor represents about 60 per cent of the total operating cost. Table III shows the number of flasks produced per man employed in California and in Italy.

TABLE III. COMPARATIVE ANNUAL PRODUCTION OF QUICKSILVER

	Flasks Annual Production Per Man Employed	Extraction in Lb. Per Ton Treated
California	25.1 (*a*)	6.7
Italy, Monte Amiata district	23.6 (*b*)	15.0

a U. S. Geological Survey. *Mineral Resources*, 1917.
b Dr. Roland Sterner-Rainer, "The Present Status of Quicksilver Metallurgy in Europe."

The American consumer of quicksilver is then simply expected to pay the difference in cost due to the higher rate of living expenses of the workers, as he does for every other necessity or luxury he consumes, not because the actual production per head is lower.

As to the relation of the London branch of the Rothschilds to the world's production, it must be noted that before the war that house controlled only 34.1 per cent of the total world production. The Rothschilds now control both the Spanish and the Italian production, 57.7 per cent, and will probably also control the former Austrian production, making the total proportion of the world's production under their control, 77.4 per cent. This condition presents an entirely different aspect than before the war, and certainly justifies the statement that, unless some protection be given by the Government, the domestic producers are entirely at the mercy of the interests mentioned.

The producers are satisfied with the present market price; all they ask is that some stability be given to that price and that they be not forced by foreign intervention to close down, in which case the consumer would eventually be in a much worse position than could result through reasonable tariff protection.

That the producers of the less common metallic minerals are small in number, and hence are placed at a disadvantage when trying to protect their interests, has again been emphasized by the decision of the U. S. Attorney General regarding the compensation that operators of the so-called war minerals are entitled to, in the reimbursement of their loss, from the fund appropriated by Congress for their protection. Compare this with the protection granted the dyestuff and potash industries, which have related interests that command consideration. If it is good economic policy to kill the quicksilver industry, because quicksilver can be bought cheaper from foreign countries, is it not equally good economic policy to import cheaper dyestuffs and potash, even if it destroys those two industries, which were developed here only because of war conditions? If the economic policy of internationalism, which has re-

cently found many advocates in this country, is correct, then at least carry it out in all lines of business, and do not restrict its application to those industries which lack sufficient political backing.

I fully recognize that the conditions under which the quicksilver industry operates are different from those of the dye and potash industries. This, however, does not preclude that the former is equally well entitled to protection as are the latter. The domestic quicksilver industry is in the peculiar position that its production can never become an important article of export, especially in the altered conditions of the world's production brought about by the war. On the other hand, it can for years to come cover the demand of the domestic consumption, as it has done for seventy years. This is simply a question of sufficient protection. Though the domestic production somewhat decreased during the last twenty years, it still remained about equal to the domestic consumption. This decrease was mainly caused by the low market price of the metal, which is established in London. When the prices justified it the production was increased from 16,548 flasks, in 1914, to 36,159 flasks, in 1917; which appears to me a conclusive argument that the decreased production was not due to deficiency of raw material, as is often claimed, but to the conditions which govern the market value of the metal.

Under the conditions governing the present world's market the domestic quicksilver industry is at the mercy of the Rothschilds, who, if they so desire, can undersell the domestic producers in all foreign markets, and in the United States, if they are not protected by a reasonable tariff. In fact, the protection of that industry is as much to the interest of the consumer as to that of the producer, because if the latter is wiped out the former is at the mercy of the foreign monopoly, which certainly will avail itself of its opportunity.

In the last years preceding the war production kept up, notwithstanding that the market price was below the cost of production of several of the operators; and even in those years developments of cinnabar deposits were made in some of the Western states, even though on a small scale. This would tend to prove that the exhaustion of cinnabar deposits in the United States is not as complete as maintained by some authorities.

The actual conditions are threatening to the quicksilver producers, and they can protect themselves only by concerted action, and by associating themselves with the body of American producers of all kinds of minerals, and working together for mutual benefit.

WILLIAM FORSTNER.

San Francisco, July 17, 1919.

Pillar-Shaft Gyratories vs. Lever Type

I have read the very able article of Herbert A. Megraw covering the "Design of Small Metallurgical Mills" appearing in the June 28th issue of the *Journal*. Under the section "Rock Breaking in Small Mills," Mr. Megraw makes the following statement in relation to gyratory crushers: "Any rock crusher, whether jaw or gyratory, which takes the crushing pressure directly upon a bearing is mechanically wrong, and has not taken advantage of the features inherent to the type of the machine."

I am taking the liberty of calling attention to a few relative points of the two most distinct types of gyratory crushers, i.e., the pillar-shaft machine, taking pressure "directly upon a bearing," and the older lever-type machine. It is probably a fair assumption that neither type of machine is mechanically perfect. The question is therefore one of relative mechanical design for the two types. Mr. Megraw refers this question to the definite point of bearing pressures, and, as such, it is hardly a matter of opinion but one of fact, and the general statement above quoted cannot possibly be made to stand up under a more exact analysis.

In either type of machine pressures are, of course, transmitted to bearings, and this cannot be considered any great crime in machine design. That being the case, the argument logically evolves around unit pressures, which is the case in any machine design—crusher or otherwise.

There are two machines which I have in mind, both working on the same material. One is a pillar-shaft type and the other a lever-shaft type of crusher. The pillar-shaft type machine has a projected inside eccentric area of 688 sq.in. The lever-type machine of the same rating has an inside projected eccentric area of approximately 228 sq.in. The lever-type machine has a lever ratio of two and a half to one, or, in other words, the throw of the eccentric is approximately two and a half times as great as the throw of the head at the bottom of the concaves. Therefore, to exert the same crushing pressure, under identical conditions, the pillar-shaft machine would require a relative projected area of two and a half times the 228 sq.in. area, or, 570 sq.in., whereas it actually has an area of 688 sq.in., a 20 per cent surplus area by the most liberal comparison to be made in favor of the lever-type machine. The respective shafts in shear, as well as beams, are greatly favored by the pillar-type machine in all present designs. When it is borne in mind that the eccentric of the pillar-type machine has an extension greater than the entire length of the crushing head, the reason for this enormous area can be better realized. (Belt speeds and gyrations are about equal.)

The foregoing paragraph is a fair approximation of the definite points to which Mr. Megraw refers on two machines of the same capacity working on the same material.

Now, regarding the general reference to short-shaft machines where "the power for crushing is applied almost directly to the bearing of the eccentric." Whether the shaft is long or short, there is probably no reason to change the number of gyrations per minute for the same conditions. Therefore the r.p.m. on the eccentric would be constant. Consequently, should the designer desire to decrease the shaft length by one-half, he would probably increase his eccentric surface area by two and maintain the identical conditions with reference to bearing pressures, crushing pressures, and like factors, the belt speed and power remaining the same.

Crushing rolls have for years been used with more or less success. They are designed to take the crushing pressures directly on the journals, and this to date has not condemned the machine as anything approaching a mechanical monstrosity.

No crusher is a great example of nice mechanical design. The work which crushers are supposed to do would hardly permit of it. However, should I look over the two machines for unmechanical features I should probably be struck with a shaft loosely hanging by its end.

Reduced head-room is not a fundamental in the design of the pillar-type machine. The discharge of the pillar-shaft gyratory is circular, and by the time Mr. Megraw builds his discharge chute to take care of this he will find that reduction in head-room is more apparent than real. In any event, any advantage in this direction is incidental.

The real advantage of shortness is a greater weight per vertical foot of machine than in the lever-shaft type machine. For instance, a typical lever-shaft gyratory weighs approximately 7,600 lb. per ft., whereas a typical pillar-shaft machine weighs approximately 10,000 lb. In this, the shortness of the machine proper in relation to the total weight is a distinct advantage in the great additional strength which it imparts to the bowl.

This is no attempt to detract from the crushing properties of the pillar-type machine, but I would like to call attention to its crushing stroke parallel from top to bottom, its therefore constant angle of nip, and the use of the general concave surface as a crushing area, instead of concentrating the wear. R. L. SITES,

Brown and Sites Co.

30 Church St., New York, N. Y., July 31, 1919.

Packing Goods for Shipment To South America

The writer has recently returned from a short trip along the West Coast of South America, and has, as most Americans do, heard a great many complaints about the way in which American goods for foreign shipment are packed. Because of the difficult landing conditions for ocean-going steamers along the West Coast, goods have to be especially well packed if they are to arrive in a proper condition. Most of the complaints concerning inadequate packing are unquestionably well founded, and I believe you could do no better service toward the extension of foreign trade for American manufacturers than to either run an editorial or in some forceful way bring this matter to the attention of those expecting to do foreign business.

Packing is, after all, such a simple operation that it would seem only necessary to have this matter placed before manufacturers to insure American goods arriving in foreign ports in a condition as good as or better than goods from other countries.

New York, Aug. 8, 1919. D. S. MCAFEE.

[American manufacturers should take to heart the criticism made by Mr. McAfee. At frequent intervals our shippers have been admonished to pack their goods properly. A little common-sense in this regard would avoid unnecessary damage, not only to the goods but also to the reputation of our manufacturers. The last warning issued by the *Journal*, regarding the packing of goods for shipment to South America, appeared in the issue of July 19, 1919, on page 91.—EDITOR.]

Hoping for a Settlement

In the past I have asked for frequent changes in the address of my *Journal*, but this has been due to the political situation. It would appear from newspaper reading that I am again making a mistake in asking that the *Journal* be sent here, but as we are building a small mill and cyanide plant, and hope to complete the installation by the end of the year, I may as well chance the *Journal's* getting through long enough to be of considerable service meantime. We are out in the hills, have a hard time to gage the course of events, and I value the *Journal's* political comments more than I do those of any other individual newspaper.

Those of us that suffered directly all the evil effects of the variable policy of our home government regarding Mexico during the critical moments of the revolution, and have hung on here to our properties and tried to protect them, in the hope that time would cause a change in politics, have abandoned hope of that and resolved to try to work the properties under existing conditions, and so are now again exposed to material losses if the existing situation be upset.

It is hard to define our feelings toward the present movement in the States to force an issue on old questions. We hoped and prayed for such action in the past, lost hope and decided to try to do something in spite of conditions, and now find ourselves under way again, and likely to be up against a new turmoil. As, in our hearts, we never did give up faith that eventually the American people could be depended upon to do the right thing, we reluctantly admit that we would rather suffer further troubles, so that the matter may finally be disposed of as it should have been in the first place. We have one consolation: that we know that a large part of the Mexican population feels just as we do about it, and is resigned to swallow pride and to undergo inconveniences in order that affairs in the end may be definitely settled.

A SUBSCRIBER IN MEXICO

[Signature deleted—EDITOR.]

Protection of the Potash Industry

Your editorial of July 26, on the supposed protection to be afforded the potash industry by the Germans themselves may record one of those actions which have been indulged in by the Germans so frequently of recent years as to be termed "Teutonic." It is within the bounds of possibility that the price may be raised in Germany for the very purpose of enabling the potash syndicate so much the better to pursue its usual tactics of destroying competitive business in other countries. Coming as it does just at the time when the American Congress is giving consideration to action at which from tradition American Congresses have always balked, the Teutonic nature of the possibility is all the more to be feared.

When it is so well known that the American potash industry, secured behind the impregnable wall of a license embargo, would rapidly develop to the point where American prices would be cheaper than those of any other country in the world, it seems a shame to allow foreign material to destroy this industry in embryo, or by constantly holding up the bugbear of impending floods of foreign material to prevent American development on any other than the expensive scale which constantly holds itself in readiness to be destroyed in the near future. As a matter of fact, the United States can match Germany in every single potash possibility except the present possession of more than one hundred potash mines with many years of exploitation behind them on which to base knowledge of future activities. H. D. RUHM.

New York, Aug 2, 1919

The Dutch East Indies exported to the United States during the first three months of 1918 a total of 6,785,933 lb. of tin and 85,751 lb. of potash. In the corresponding period of 1917, the exports of tin were 8,908,595 lb., and of potash, 47,753 lb.

DETAILS OF PRACTICAL MINING

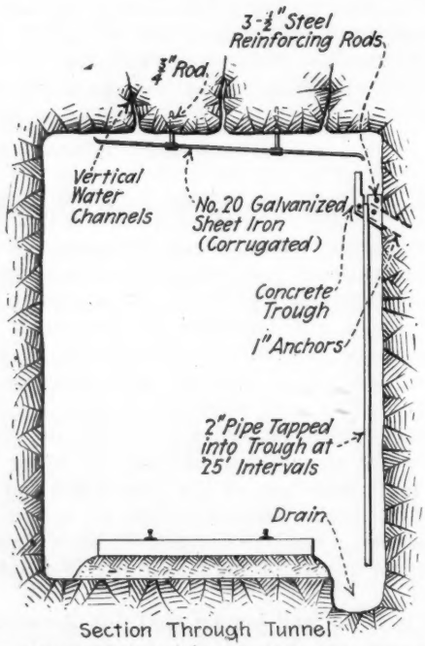
Suggestions From Practice for the Superintendent, Foreman, and Miner

Water Drain for Wet Roof

BY ROY H. POSTON

In driving a drift to be used as a main haulageway at a mine in Southeast Missouri, the workmen cut several water-bearing strata that continued to flow after the drift was completed. As a means of preventing the leakage of water from the roof, a system of collecting and draining, shown in the sketch, was satisfactorily installed at a moderate cost and with little consumption of time.

As the continuous dampness made the preservation of



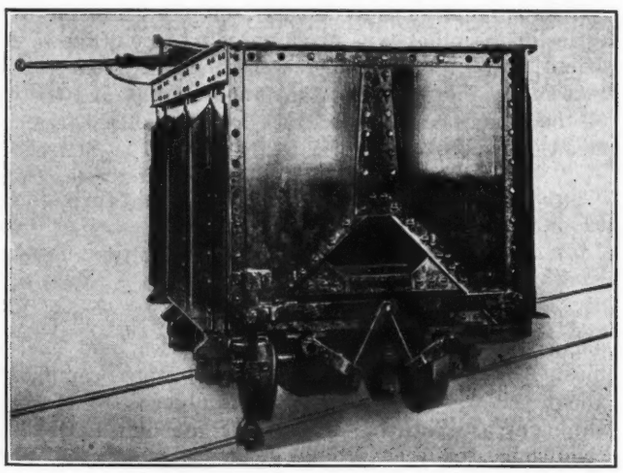
WATER DRAIN FOR TUNNEL HAVING A WET ROOF

wooden construction difficult, concrete installation was decided upon. Considering that this latter type imposes practically no cost for maintenance, and that the wet part of the tunnel was short, the additional initial expense was considered justifiable and a permanent installation was provided.

Improving Top-Landing Haulage Equipment

BY LOUIS C. MOORE

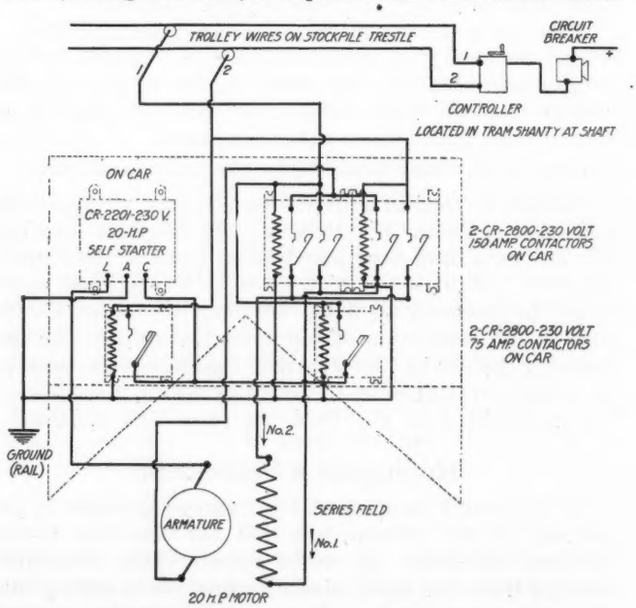
Several changes have been made in the last ten years in the methods used for stocking iron ore in the Lake Superior region, and few of the mines continue to use the man and car system, which is now replaced by either electric locomotive, haulage or endless-rope or gravity tram systems. The objection to electric locomotive tramming is not so much a matter of expense of equipment as it is the danger to which the operator is subjected, for records show many instances of locomotives that have jumped poorly-constructed ore-trestle tracks and landed below, with the operator either dead or maimed for life. Furthermore, the rolling load, consisting of locomotive, car and ore, as compared with the



SEVEN-TON REMOTE CONTROL STOCKPILE CAR

weight of ore carried, is excessive. This combination has in most cases been abandoned in favor of other methods in stockpiling practice.

The endless-rope system in connection with long trams, though reliable, is expensive and inefficient. Each

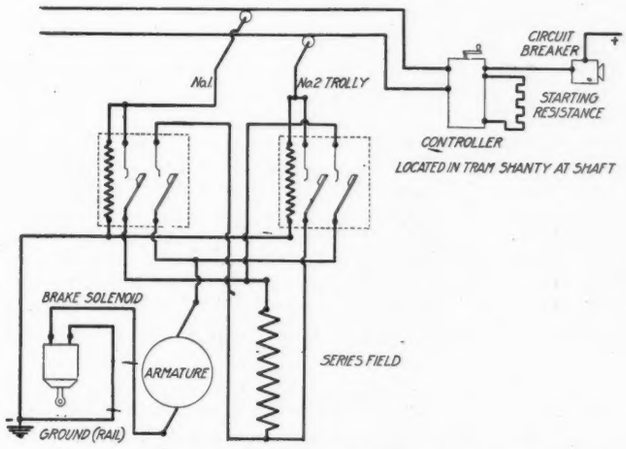


WIRING DIAGRAM FOR SEVEN-TON MOTOR-DRIVEN CAR

winter a mile of ⅝-in. wire rope is worn out, in addition to the spools, rollers, deflecting sheaves, and other material necessary to the installation. A 50-hp. haulage engine is required to overcome the friction of such a

system, the work of which should be done by a 15-hp. motor. Gravity trams are satisfactory for some stockpiles requiring no trestle, but are too slow and adapted for the longer trams.

As a means of eliminating the bad points of these systems, some pioneer work has been done on the Gogebic Range. In 1914 Carlos Holley, then master mechanic at the Ironton and Colby mines of the McKinney Steel Co., built a 3-ton saddle-back car. This was driven by a Jeffrey 1,080 series motor on each axle, connected



WIRING DIAGRAM FOR THREE-TON STOCKPILE CAR

through a two-trolley wire system over the haulage track, and was operated by remote control, so that the operator could remain at the shaft and start or stop the car on the trestle. The speed was about 1,000 ft. per min. and the car was equipped with brakes controlled by a solenoid placed underneath the car and between the axles. This car was put into service in 1915, it is still being used, and has given such satisfactory results that three similar cars were built, and these are still in service.

Adopting this idea, the Yale mine ordered, from the Lake Shore Engine Works, two 7-ton cars equipped with similar remote control. All brake mechanism on these was left off, each car being stopped by reversing the motor. One of these cars is shown in an accompanying illustration. Another improvement was the door-catch mechanism, which held the door at the bottom in four places, instead of at the ends, and this stopped the door from bulging and permitted lighter construction. A comparison of wiring diagrams for the two cars is shown in an accompanying sketch.

One other property, the Eureka mine, is experimenting with a similar car. In this design the motor is chain driven to the axle, and a ratchet drum controller is attached to the door-catch trip roller on the car, so that each time the door is opened the circuit is reversed at the car. By this method only one trolley wire is needed; whereas the other cars require two. A serious drawback to this method is that if the trip failed to operate on a foggy day, when the car went out the operator might run the car toward the end of the trestle when it should be coming in the opposite direction. With a two-wire trolley no such mistake can be made.

Other schemes are being developed to achieve practicable remote-control operation and control, and the final outcome should produce a car of any capacity needed, operating with a one wire trolley on either 220-volt a.c. or 240 volt d.c. The car speed will vary from 500 ft. to 1,500 ft. per min., and a braking system will no doubt be evolved that will positively stop the car at critical points. Any manufacturing concern making such a car could develop considerable business on that product alone and such development work would require much less experimenting than more complicated machines, such as mechanical loaders.

The remote-control car, wherever tried, has given satisfaction both during the winter and summer seasons. It requires little attention to keep it in good condition, the up-keep cost is small. There are no ropes or cables to wear out, and no spools, rollers, or deflecting sheaves to replace or oil every morning. If it jumps the track and falls 40 ft., another can be substituted in much less time than with the endless-rope method, and no one is killed or injured. The necessary repairs are small compared with the repairs needed on a locomotive that had dropped the same distance. By means of lamps the operator at the shaft is advised of the position of the car at all times during the darkest night, and if a trolley wheel jumps the wire, which seldom happens, he is instantly notified and can remedy the difficulty. From every standpoint the car is a big improvement over the tram systems now generally used.

Drinking Fountain in Mine

To provide good drinking water for men working underground is most desirable. Formerly it was seldom that the men were able to obtain a drink of pure, uncontaminated water underground. In a number of instances in several districts the practice was to catch a small stream of mine water which was trickling over the wall rock, at a convenient place, in some sort of an improvised vessel. Another method was to catch the water in a

UNDERGROUND DRINKING FOUNTAIN

depression in a rock, from which the men would quench their thirst. The accompanying illustration shows an installation of a drinking fountain in one of the underground workings of the Oliver Iron Mining Co., a subsidiary of the U. S. Steel Corporation. This illustration has been reproduced from the bulletin of the Bureau of Safety, Sanitation and Welfare of that corporation.

The advantages of installing such a simple device at numerous places underground over the old system of making no adequate provision for the comfort of the miners is obvious.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Tariff on Tungsten and Other Ores

Tungsten, magnesite, and zinc are practically assured of the rates of duty proposed by the Ways and Means Committee of the House. Consideration of the emergency tariff bills has gone far enough to disclose definitely that the Republican majority will be able to carry through any plan upon which it agrees. The Democratic opposition is split on the emergency tariff measures, many members of that party being ready to vote for a duty sufficient to insure continuance of the industries built up in the country during the war. The leadership of the Democratic party is urging a license system in preference to a tariff, but is unable to muster the votes to make such a policy general. The Republicans themselves are divided as to the extent to which the licensing system should be applied to dyestuffs.

With the exception of the bill providing new duties for chemical glass and porcelain ware and scientific apparatus, none of the tariff measures, at this writing, has been passed by the House. The tungsten bill was the subject of debate on Aug. 14, and its passage, as it was reported out, is assured.

It had been planned originally to put through promptly all of the emergency tariff bills. The plan was interfered with first by the arrangement to take a six-weeks' vacation. When it was decided to hold the House in session, living-cost and Railroad Administration legislation came in for prior consideration. The Senate, in the throes of peace treaty and living-cost consideration, has made no plans for taking up tariff matters.

The tungsten bill came from the committee with only technical amendments. In urging its adoption by the House, the author of the bill, Representative Timberlake, of Colorado, made the following statements:

This bill asks for a tariff of $10 per unit, a unit being 20 lb. of tungsten trioxide contained in a short ton, so that this tariff would bring a revenue to the Government of $10 per unit of every 20 lb. of tungsten trioxide that is imported into this country. With the known fields, it is estimated that we can today produce from 50 to 60 per cent of all the tungsten used in this country, and we feel that with this encouragement, which will aid in the development and seeking out of new fields, it will require only a short time until this country, by reason of the discovery and developments that have been made, will become independent of these other resources for tungsten.

In the course of the discussion, Representative Baker asked the following question:

What effect would the proposed legislation have upon the approximately 5,000 tons of ore now in storage in and about New York? Would they get this raise in the tariff?

To which Mr. Timberlake replied:

I am rather of the opinion that the provisions of this bill could not apply to the product that had already been bonded in this country coming from abroad.

With regard to increasing costs to the consumer, Representative Vaile, of Colorado, endeavored to point out to the House that there would be no important increase in the costs of tungsten products to the consumer. In that connection, he said:

Per pound of finished tool steel, the increase would be not more than 15c. according to my correspondents, allowing for loss in smelting, and they are making a very liberal allowance for loss in smelting. Tungsten tool steel is used in general for the manufacture of high-class steels, and I am reliably informed that only one pound of tool steel is required for the production of from two to three thousand pounds of finished steel. Assuming, therefore, that one pound of tool steel per ton of finished steel is used, it will be obvious that the additional cost of finished steel due to the tariff is entirely negligible. In other words, 15c. would be divided by 2,000, which equals seven and one-half one-thousandths of a cent per pound of finished steel, an entirely negligible addition to the cost of the finished-steel product.

Magnesite Tariff Bill

There is pending in the House a bill (H. R. 5,218) placing a duty of ½c. per lb. on magnesite, commercial ore, either crushed or ground; ¾c. per lb. on magnesite, calcined, dead-burned, and grain; ¾c. per lb. and 10 per cent ad valorem on magnesite brick.

Some of the arguments made in support of the bill in the report submitted by the Committee on Mines and Mining were as follows:

The sworn statements of six of the largest domestic producers were filed with the committee, showing the average cost per ton, without profit, of the dead-burned magnesite delivered at Atlantic ports to be $41.20 at the present time. The testimony also showed that the pre-war selling price of the Austrian product, including profit, in the United States was $16.15, making a difference between the present cost, without profit, of American magnesite laid down on the Atlantic seaboard and the pre-war selling price of the Austrian product $25.05.

While the magnesite producers urged upon the committee that higher tariff rates are necessary than those provided in the amended bill, yet, owing to the lack of showing and knowledge of future conditions in Austria with respect to this commodity, and particularly with regard to the cost of the same, and having regard to all the testimony and conditions as presented, the committee resolved the matter upon the basis of the rates specified in the amended bill. They believe that under such rates the domestic producers and manufacturers will be able to compete upon equal terms with the Austrian product.

In this connection it appears that a quotation has been made for the delivery of Austrian magnesite, f.o.b. Atlantic ports, at $26.50 per net ton, as compared with the pre-war selling price of $16.15 above referred to.

The testimony showed that an ocean rate on Austrian magnesite has been fixed of $7.50 per ton, as against the pre-war rate of approximately $2 per ton, and as this material is used as ballast it is possible that the ocean rate may be subsequently reduced to approximately that of normal times. On the basis of such quotation for present delivery a differential between the present Austrian selling price, including profit, and American magnesite at Atlantic ports, without profit, is $14.50 on dead-burned magnesite, and the tariff rate of ¾c. per lb. provided in the amended bill is therefore deemed adequate.

A tariff of ½c. per lb. has been placed upon crude magnesite ore, as the testimony shows that without protecting

the crude material it would be possible to defeat the object of this bill by importing crude magnesite into this country and then manufacturing it into dead-burned or calcined magnesite at such a price as to prevent the production of dead-burned magnesite in this country.

The testimony further developed the fact that it requires two tons or more of crude magnesite to make one ton of dead-burned or calcined magnesite.

The testimony shows that magnesite brick consists only of the dead-burned magnesite to which water has been added and then pressed into the form of a brick. It was, therefore, necessary to place the same specific duty on the material in the brick as upon dead-burned magnesite, for the reason that if the brick were imported without this duty they might be broken up and we would have in fact loose dead-burned magnesite admitted without specific duty, and would thus defeat the purpose of this bill.

The Sixty-fifth Congress passed a bill appropriating $8,500,000 to repay the net losses of American producers of pyrites, chrome and other essential war minerals. Only such minerals as the Interior Department had to urge the production of were included in the bill. These minerals were not dependent alone upon Austria, as in the case of magnesite. The shortage of magnesite was prevented by the prompt action of producers, who, knowing the United States was dependent upon Austria alone, were able to calculate a probable shortage during the war, and the Government was not compelled to stimulate production of magnesite. Had the magnesite producers failed to produce this material the Government would have had to stimulate production, and then the magnesite producers would have been included in the War-Minerals Relief Bill and have been repaid for their losses. They were not included, for the above reason. The proposed tariff will not repay their losses, but will give the magnesite producers an opportunity to endeavor to earn a profit on their war investment of $3,500,000, and at the same time furnish an essential mineral to the steel, copper, and lead industries.

Minerals Investigations of the U. S. Bureau of Mines

The usual monthly bulletin on Minerals Investigations was not issued for July, according to an announcement by Van. H. Manning, director of the U. S. Bureau of Mines, but such information as is available will be released at the regular time each month.

The work on minerals investigations was carried on under a special appropriation made during the war, which appropriation expired on June 30, causing a considerable part of the staff engaged in this work to be disbanded. It is expected that in the course of the next month or two the bulletin will be resumed in some form.

The Bureau believes that this work has been of value to the industries concerned, and is willing to make every effort to reorganize and maintain this work on such scale as may be possible.

Awards Under War-Minerals Act

Payment of $219,607.90 to the Chestatee Pyrites and Chemical Co., in full payment of the company's claim against the Government, has been authorized by the Secretary of the Interior. The company's claim as filed called for $914,172.73. It is understood that the claimant will not accept the award, except in part payment, and will continue its effort to secure the amount of damages claimed.

While the War-Minerals Relief Commission has made awards in several other claims, none other than that of the Chestatee company has been approved by the Secretary.

Foreign Trade in Metals and Ores

Imports and exports of the more important metals and ores, as reported by the Department of Commerce for June, 1919, and the figures for June, 1918, as finally revised, are as follows:

IMPORTS, JUNE, 1918 AND 1919

(In pounds, unless otherwise stated)

	June, 1918	June, 1919
Antimony ore, contents	360,814	*Nil*
Antimony matte, regulus or metal	1,951,044	1,617,098
Copper:		
Ore, contents	5,079,450	3,560,057
Concentrates, contents	4,195,525	2,985,286
Matte, regulus, etc., contents	2,349,300	1,187,607
Imported from (in part):		
Canada	2,650,674	2,452,560
Mexico	5,415,753	3,862,083
Cuba	1,613,116	632,000
Chile	1,629,185	342,383
Peru	*Nil*	22,804
Unrefined black, blister, etc	13,801,332	19,842,478
Refined, in bars, plates, etc	282,432	3,721,956
Old, etc., for remanufacture	100,696	211,034
Composition metal, copper chief value	19,640	*Nil*
Lead:		
Ore, contents	2,302,941	1,686,453
Bullion, contents	16,479,770	4,664,488
Imported from (in part):		
Canada	1,252,460	799,805
Mexico	17,050,868	5,551,026
Pigs, bars and old	*Nil*	22,880
Pyrites, long tons	31,172	50,545
Imported from:		
Spain, long tons	13,881	46,787
Canada, long tons	17,291	3,758
Tin ore, long tons	1,060	*Nil*
Tin bars, blocks, pigs, etc	15,130,205	112,000
Imported from (in part):		
United Kingdom	1,679,910	56,000
Straits Settlements	7,262,750	56,000
Dutch East Indies	1,369,615	*Nil*
Hongkong	2,954,221	*Nil*
Australia	577,920	*Nil*
Zinc:		
Ore, contents	4,053,254	2,720,726
Imported from:		
Canada	1,142,422	1,176,679
Mexico	2,910,832	1,544,047
Blocks or pigs, and old	1,425	*Nil*
Manganese ore, long tons	38,427	31,550
Imported from (in part):		
Cuba, long tons	1,817	321
Brazil, long tons	31,481	27,457
Br. India, long tons	4,550	1,000
Tungsten ore, long tons	656	338

EXPORTS OF COPPER, LEAD AND ZINC

(In pounds)

	June, 1918	June, 1919
Copper:		
Ore, contents	109,335	2,100
Concentrates, contents	129,428	*Nil*
Unrefined, black, blister, etc	1,069,737	970
Refined, in ingots, bars, etc	70,902,177	24,250,659
Exported to (in part):		
France	31,929,488	3,136,421
United Kingdom	26,921,159	6,085,397
Canada	1,550,962	2,078,637
Sweden	*Nil*	2,520,000
Composition metal, copper chief value	24,299	10,175
Old and scrap	*Nil*	725
Pipes and tubes	447,482	556,422
Plates and sheets	303,592	514,138
Wire, except insulated	1,758,328	4,766,354
Lead:		
Pigs, bars, etc., produced from domestic ore	12,208,228	1,519,696
Pigs, bars, etc., produced from foreign ore	5,473,282	15,263,368
Exported to (in part):		
Italy	1,299,200	*Nil*
United Kingdom	8,719,634	9,864,043
Canada	6,684,586	497,224
Argentina	307,199	1,050,437
Japan	484,422	3,606,400
Brazil	131,189	322,419
China	*Nil*	145,814
Netherlands	*Nil*	448,000
Zinc:		
Dross	3,761,844	581,893
Spelter:		
Produced from domestic ore	12,895,218	18,489,575
Produced from foreign ore	833,925	5,547,502
Exported to (in part):		
France	8,387,822	12,206,822
Italy	1,706,189	1,377,113
United Kingdom	2,267,296	7,970,611
Canada	1,217,219	107,246
Japan	*Nil*	111,975
Australia	*Nil*	246,497
In sheets, strips, etc	1,919,789	1,671,454

Chicago Meeting, A. I. M. E.

One Hundred and Twentieth Gathering of the Institute, Monday, Sept. 22, to Friday, Sept. 26, inclusive, 1919—Headquarters, Congress Hotel—

Program of the Sessions

THE American Institute of Mining and Metallurgical Engineers will hold its 120th meeting in Chicago, Sept. 22 to 26, inclusive. Headquarters will be at Congress Hotel. Carl Scholz is chairman of the committee on arrangements. Other members of the committee are F. G. Fabian, H. H. Stoek, L. V. Rice, J. A. Ede, G. M. Davidson, F. W. DeWolf, R. W. Hunt, F. T. Snyder, E. B. Clark, F. S. Peabody, and Mrs. C. H. MacDowell.

Technical sessions will be held on the following subjects: Mine Taxation, Iron and Steel, Sulphur in Coal, Pyrometry, Non-Ferrous Metallography, Coal and Gas, Milling, Oil, Industrial Organization, Geology, Non-Ferrous Metallurgy, Mining, and Local Resources.

Trips of inspection will be made to the Gary steel plant; zinc smelteries, coal mines, cement works, and permanganate plant in the La Salle district; mining machinery manufacturing plants, and tungsten and molybdenum reduction plants in North Chicago and Milwaukee; lead and oil refineries in East Chicago and Whiting; coal fields at Franklin and McCoupin; and varied metallurgical and manufacturing plants in Chicago.

Summary of the program follows:

SUMMARY OF PROGRAM

MONDAY, SEPT. 22

9 a.m. to 9 p.m., registration at convention headquarters, Congress Hotel.

11 a.m., special session on mine taxation in co-operation with the Internal Revenue Department (?), U. S. Treasury.

Technical sessions: Non-ferrous metallurgy and metallography. Coal and gas.

2 p.m., technical sessions: Coal and gas;
Milling;
Industrial organization;
Geology.

8:30 p.m., smoker, at Chicago University Club, Michigan Boulevard, four blocks north of Congress Hotel.

TUESDAY, SEPT. 23

Trip to Gary steel plant.

All-day excursion by steamer from Chicago, direct to the plant of the U. S. Steel Corporation at Gary, Ind.

The steel company's special observation train will convey the members and guests through the various parts of this immense and famous establishment. This will afford an opportunity to see in operation the most modern and approved methods in the manufacture of steel and large-scale production.

Luncheon will be served at the steel plant.

On this and other excursions a large attendance by the ladies is desired.

On the return trip on the boat there will be a session on Iron and Steel, with especial reference to blast-furnace work. (?)

8:30 p. m., technical session on oil.

Technical session on iron and steel, followed by moving pictures of a 240-inch plate rolling mill, the largest in the world.

WEDNESDAY, SEPT. 24

10 a.m., technical sessions:
Symposium on sulphur in coal;
Iron and steel;
Mining and local resources.

2 p.m., technical sessions:
Symposium on sulphur in coal;
Pyrometry, with especial reference to steel;
Non-ferrous metallurgy.

6:30 p.m., president's reception, Congress Hotel.

7:30 p.m., banquet, followed by dancing, Congress Hotel.

THURSDAY, SEPT. 25

10 a.m., technical session:

Symposium on pyrometry. (A collection of papers marking an epoch in metallurgical literature.)

All-day excursion to the La Salle district.

Arriving at La Salle, the Illinois Valley Manufacturers' Club and the local Chamber of Commerce will be hosts at a luncheon at the Kaskasha Hotel.

In the afternoon, various parties of members and guests will be formed and taken in automobiles to the zinc smelteries, coal mines, or cement works. For those not particularly interested in these operations, there will be an automobile trip, of particular interest to the ladies, to Starved Rock and the beautiful Illinois Valley.

FRIDAY, SEPT. 26

Optional Excursions

A—North Chicago and Milwaukee:

The trip will be made by special train leaving Chicago over the C. & N. W. R.R. Friday morning, Sept. 26, to visit the mining machinery manufacturing plants of Milwaukee.

The train will stop at North Chicago at the Fansteel Products Co.'s plant, where the members will be shown the complete metallurgical processes in the production of metallic tungsten and molybdenum, from the purification of the crude concentrates as purchased in the market, and including the sintering of finely divided metallic powder into ingots by passing through it electric currents of enormously high amperage.

The operations include all those involved from the treatment of the tungsten ore to the finished product, which includes the chemical treatment of the ore and the purification of the tungsten material; the reduction of tungstic acid to tungsten powder; the pressing of this powder into ingots by means of hydraulic presses; the heat treatment and sintering of these ingots and their swaging to finished rod of various diameters; the cutting of the rod into disks—and the operations connected with the welding of these disks to iron screws and rivets of various kinds—and the finishing operations involved in the production of the final tungsten contact points.

In connection with molybdenum, operations can be seen involving purification of the material; its reduction to powder; sintering of the bars and their swaging to rod and wire; also the operations in producing sheet molybdenum.

Though the operations to be seen at this plant are not large in number, they are out of the ordinary and are of particular interest to most persons who see them, because of their unique character. Visitors to the plant have been much interested in the research laboratory, which is provided with all necessary equipment for carrying on research work in connection with the lines in which the company is interested.

A stop will be made at Cudahy, where the train will be switched in to the plant of the Power & Mining Machinery Works of the Worthington Pump & Machinery Corporation, where the members will be given an opportunity to inspect not only mining machinery but also a full line of internal combustion engines.

From Cudahy, the train will go direct to the plant of the

Allis-Chalmers Manufacturing Co. at West Allis, arriving there in time for luncheon, which will be served at the Allis-Chalmers Club. After luncheon, guides will be provided to pilot members through the plant, and ample time will be given to make a thorough inspection.

For those ladies who may not care to visit the manufacturing plants, automobiles with guides will be provided to take them through the parks and residential parts of the city.

For members wishing to visit any other manufacturing plants of Milwaukee which may be of particular interest to them, suitable arrangements will be made.

The train will be run from the Allis-Chalmers Manufacturing Co.'s plant to the C. & N. W. depot, at the foot of Wisconsin St., where the ladies and members visiting other plants may board the train.

B—East Chicago and Whiting:

Lead refinery of International Lead Refining Co.

Luncheon at Hammond Country Club.

Oil refineries of Standard Oil Co., Whiting, Ind.

C—Coal Trip to Franklin and Macoupin Counties, leaving Chicago late Thursday evening, and spending Friday in the coal fields.

D—Local Industrial Plants, Chicago:

Nearly every industry in the metallurgical and manufacturing line is represented by one or more modern, economical plants in Chicago. The Committee on Local Industries is preparing a list of these which can be visited, and trips for inspection will be arranged in accordance with the desires as expressed by the members.

LADIES' COMMITTEE

The wives and daughters of all members are most cordially invited to attend the Chicago meeting. The banquet and the various excursions are being planned with a special view to their enjoyment by the ladies in the party. Also a special Ladies' Committee has been appointed, of wives of members of the Chicago Section, which is arranging an attractive program for the entertainment of the women guests. They will be shown the points in Chicago which are of particular interest to them.

NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES

The Fifth National Exposition of Chemical Industries will be in progress at the Coliseum and First Regiment Armory, Chicago, during the week, and at intervals during the meetings members of the Institute are invited to visit the exposition. The badge of the Institute will be the only pass required at the doors. Ladies are invited.

MID-WEEK BANQUET

It is thought that by having the banquet in the middle of the week a maximum attendance at this function can be obtained. Members who for some reason are unable to come to Chicago for the entire meeting will then be able to be present at the banquet, whether they come for the first or the latter half of the week. The members of the Institute and their wives will be the guests of Chicago at the banquet.

LA SALLE TRIP

From the standpoint of scenery, geology, mining, and industry, the itinerary of the trip to La Salle, Ill., is difficult to surpass. The committee has arranged all details with a view to the convenience of the visitors, and will furnish automobiles, luncheon, guidance, and other accommodations.

Viewed in the vicinity of La Salle, the appellation "Prairie" State for Illinois is a misnomer. There are scenic beauties rivaling the Appalachians. The rock structure is unique. Deep canyons abound. Starved Rock and Deep Park are the mecca of tourists. The district is rich in tradition and historic lore.

Geologically, the section is of great interest; the lower formation, or rocky base, of the state is exposed. The La Salle anticline, illustrated in a souvenir booklet, may be viewed and studied readily at first hand.

In the coal fields mining on the longwall system prevails. The room and pillar system, however, may be studied at one property and also the operation of the panel system with modification. There is an electrically equipped mine, and most modern methods of handling the coal at surface are demonstrated. Mining and quarrying of portland cement rock, quarrying and treatment of glass sand along the escarpment of the Illinois River, mining and quarrying of hydraulic cement, clay products and gravel also are interesting features.

Cement is manufactured by the Marquette, Lehigh and La Salle companies in enormous quantity.

Three big zinc works may be seen in operation—the Matthiessen & Hegeler, Illinois, and Mineral Point companies. The first two possess the largest zinc rolling mills in America.

The Western Clock Co., manufacturers of "Big Ben," rated as one of the model factories of the Middle West, may be visited.

Among other industries that may prove attractive are the Peru Plow & Wheel Co.; the Carus Chemical Co., where the first calcium permanganate in America was produced; several zinc-plating works; a pressed brick manufactory; and the La Salle Tool Co.

The fossilized remains of what once were two breweries are among the curiosities viewable.

DEDICATION OF BUREAU OF MINES EXPERIMENT STATION

First-Aid and Mine Rescue Contest

The Bureau of Mines extends a cordial invitation to all members and guests to visit Pittsburgh, Sept. 29 to Oct. 1, to participate in dedicating the Mines Experiment Station. Accompanying this will be a nation-wide participation in a first-aid and mine rescue contest. The Pittsburgh Chamber of Commerce will co-operate. The Institute will be represented by a special delegate appointed by the president.

MONDAY, SEPT. 29

8:30 a.m., bureau building open for inspection.

10:30 a.m., dedicatory ceremonies in rear of main building, 4,800 Forbes St.

2 p.m., special train and automobiles to experimental mine near Bruceton, Pa.

3 to 6 p.m., mine explosion and inspection of experimental mine and of explosives testing plant near Bruceton, Pa.

6 p.m., return by special train and automobiles to B. & O. depot, Pittsburgh.

8 p.m., informal reception and organ recital, Carnegie Music Hall. Arranged by Carnegie Institute of Technology.

TUESDAY, SEPT. 30

Nation-wide first-aid and mine rescue contest, Forbes Field, Pittsburgh.

9 to 12 a.m., elimination mine rescue contests.

2 to 5 p.m., elimination first-aid contests.

5 p.m., coal-dust explosion.

8 p.m., pageant glorifying the mining industry, Forbes Field.

WEDNESDAY, OCT. 1

9 to 12 a.m., final mine rescue contest.

2 to 5 p.m., final first-aid contest.

5 p.m., coal-dust explosion.

8 p.m., smoker, with award of prizes to winning teams.

Kirkland Lake Gold Mining Co., Ltd.—The annual report of this northern Ontario company for the year ended May 31, 1919, shows that a total of 5,406 feet of underground development has been completed to date, together with 898 cubic yards of station cutting. One shaft has been sunk to a depth of 500 feet and the other to a depth of 700 feet. No ore reserves are given, but development has been very satisfactory and there has been no sign of change of formation at depth. A complete 150-ton mill was put in operation this spring, and the first bar of gold bullion shipped on May 17. The total assets of the company amount to $1,610,181, of which $1,340,481 represents mining claims and development. The company has issued 2,000,000 shares.

Monthly Copper Production for 1919

The table which appears herewith is compiled from reports received from the respective companies (except in the cases noted as estimated), together with the reports of the U. S. Department of Commerce as to imported material, and in the main represents the crude-copper content of blister copper, in pounds.

MONTHLY CRUDE-COPPER PRODUCTION, 1919

	April	May	June	July
Alaska shipments (*c*)	2,153,691	1,134,272	2,374,843	3,021,912
Arizona:				
Arizona Copper	2,400,000	2,400,000	2,400,000	2,400,000
Calumet & Arizona	3,822,000	4,308,000	4,872,000	4,802,000
Cons. Ariz. Smelting	770,000	690,000	625,000	650,000
Inspiration	6,900,000	6,200,000	6,300,000	6,000,000
Magma	674,943	730,548	936,117	.....
Miami	4,489,748	4,989,580	4,385,865	4,113,452
New Cornelia (*a*)	2,000,000	1,408,000	2,708,000	2,736,000
Old Dominion	2,389,000	2,564,000	2,015,500	1,629,000
Phelps Dodge	6,560,176	6,783,900	6,680,335	7,239,075
Ray	3,650,000	3,975,000	3,890,000	3,865,000
Shattuck Arizona	*Nil*	*Nil*	*Nil*	*Nil*
United Verde	*Nil*	1,250,000	3,525,000	4,040,000
United Verde Extension	*Nil*	*Nil*	2,806,849	4,582,372
California:				
Mammoth	1,386,000	620,000	*Nil*	*Nil*
Michigan:				
Calumet & Hecla	8,554,113	6,796,819	5,439,761	6,208,517
Other Lake Superior (*b*)	6,500,000	6,500,000	5,750,000	5,750,000
Montana:				
Anaconda	13,750,000	13,500,000	10,530,000	11,122,000
East Butte	1,347,580	1,414,460	1,513,360	1,458,420
Nevada:				
Nevada Cons.	3,763,000	3,700,000	3,715,482	3,706,103
New Mexico:				
Chino	3,498,747	3,583,396	3,615,458	3,626,354
Utah:				
Utah Copper	9,420,000	9,125,000	9,528,000	8,405,863
Eastern smelters (*b*)	1,400,000	1,400,000	1,400,000	1,400,000
Total reported	85,428,998	83,072,975	85,011,570	.....
Others, estimated	13,380,000	9,580,000	10,845,000	.....
Total United States	98,808,998	92,652,975	95,856,570	.....
Imports: Ore and concentrates etc.	9,773,655	7,946,560	7,732,950	.....
Imports in blister, etc.	22,781,489	15,997,164	19,842,478	.....
Grand total	131,364,142	116,596,699	123,431,998	.....
British Columbia:				
Granby Cons.	1,333,523	1,848,802	2,072,964	.....
Mexico:				
Boleo	1,433,040	1,322,720	1,256,640	1,256,640
Cananea	3,000,000	3,000,000	3,000,000	3,200,000
Phelps Dodge, Mexican properties	1,702,000	1,552,000	1,735,000	2,516,000
Other foreign:				
Cerro de Pasco	4,780,000	4,034,000	4,026,000	3,984,000
Chile	5,024,000	5,066,000	5,003,430	.....
Katanga	4,298,970	2,094,370	4,519,430	4,442,270
Backus & Johnston	2,036,930	1,970,064	(*d*)	2,174,000

(*a*) Only electrolytic cathodes are entered. New Cornelia also produces some copper from ores sent to Calumet & Arizona smeltery. (*b*) Estimated. (*c*) Official figures of the U. S. Department of Commerce; includes Kennecott production from its Alaska mines. (*d*) Report not received.

Production of the United States by months since the beginning of the year and the corresponding figures for 1918 were as follows:

	1918	1919
January	165,431,568	135,733,511
February	160,011,364	111,649,512
March	185,525,168	102,040,460
April	163,207,096	98,808,998
May	181,070,350	92,652,975
June	166,723,599	95,856,570

The grand total includes, under "Imports in ore and blister copper," the production of such companies as Granby, Cananea, Braden, Cerro de Pasco, and Chile. As a matter of record, however, the individual figures are given after the total. We also report the copper output of the Boleo and Katanga companies, which does not come to the United States.

Foreign Trade in Copper—Erratum

In the table of copper imports, published in the *Journal* of Aug. 16, the contents of the matte, regulus, etc., imported in June was given as 2,985,286 lb., instead of 1,187,607 lb. With this correction, the total matte and regulus, etc. (contents) imported during the first six months of 1919 amounts to 19,422,846 lb.

Survey Geologists Protest

Building Commission Would Crowd Staff Into Less Space Than Occupied Formerly When Public Health Service Protested

THE members of the staff of the U. S. Geological Survey in Washington recently held a meeting to protest against the order of the Public Building Commission by which the space available to the staff is reduced about one-half, or to an average of that considered to be sufficient for the clerical forces of the departments in Washington.

In a letter sent to the chairman of the commission as a result of the meeting, it is set forth that, by the proposed reduction in allotted space, about 320 geologists, engineers, and other technical employees of the Survey, with about 260 clerical workers, must carry out their official work in 44,000 sq.ft. of floor space. This is about 20 per cent less than was occupied by a similar corps of workers in the Survey's old crowded and unsanitary headquarters, which called forth a protest from the Public Health Service. The conditions at that time led to the preparation of plans for a building specially adapted to the Geological Survey's needs, and in 1913 to the passage of the bill authorizing the construction of the new Interior Building, of which the Survey now occupies about one-third.

The Divide-Tonopah Chamber of Mines

A chamber of mines has been recently formed in the Tonopah and Divide mining districts of Nevada. The purposes of this organization, which is to be known as the Divide-Tonopah Chamber of Mines, is set forth in the following:

To serve and promote the general welfare in the Divide and Tonopah mining districts, to stimulate interest in the mining industry, and to give legitimate publicity to mining activities in this section of the state.

To so advertise the Divide district, its mines, production and activities throughout the United States that treasury stock of legitimate companies will be readily absorbed, and the value of all stock, promotion and treasury, of such companies, stabilized and sustained.

To spread information concerning the Divide district and its mines and mining companies, that the market for the stocks thereof will be greatly broadened and other capital largely attracted thereto besides that of California and Nevada, which in itself, so far as it is devoted to mining, is not sufficient to fully finance and support all the worthy enterprises of the Divide district.

To discourage the formation of dishonest and fraudulent mining companies and enterprises, to expose the attempts of such concerns to defraud the public, and to investigate and report upon each and every complaint made to the Chamber of Mines that any company, promoter, broker, or other person is treating the public or any member thereof dishonestly, fraudulently, or unfairly.

To guard the interest of the people of the Divide and Tonopah mining districts in any matter requiring attention; to protect them from fraud and imposition, and to undertake any reform necessary to or desirable for their welfare and prosperity.

To stabilize business conditions in every way possible; to prevent industrial dissatisfaction, and to adjust differences, in order that there may be no interruption of the present prosperous conditions in the Divide and Tonopah districts.

To secure accurate information of mining corporations, mining activities, developments, and progress in the Divide and Tonopah districts, and to furnish the same to all persons seeking it, and to disseminate generally such information.

BY THE WAY

In a Quandary

Two men of Sierra County, California, recently located some soda springs at Parker Flat, in the same county, with the intention of marketing the waters. Further investigation of the springs resulted in the discovery of a quartz vein 15 ft. wide. Six feet of the vein assayed $6 gold and nine feet $4 per ton, it is said. Now the owners are in a quandary as to whether mining operations would be more profitable than the water. With gold mining as it is and a great national thirst impending, we advise them to go after the soda water.

What Some People Think

Below are quoted the words appearing on the front cover of the New Jersey Zinc Co.'s Library Bulletin, issued weekly by the company's library:

The technical or trade journal of today is the livest and most "up-to-now" assistant a business man has. It is carefully edited, well printed, fully illustrated and thoroughly indexed, both as to literary matter and advertisements. It is the "always ready reference" of the minute, and the official, head of a department, or even workman who does not use it to its fullest capacity is neglecting one of his best friends.

In no other way can any business man, no matter how high or low his position, keep so fully abreast of the time in his business as by early and careful perusal of his trade and technical periodical, from its front to its back cover, and from no other source can he obtain the "immediately useful" so well as he can from a well-filled and indexed present volume of those same publications.

The Dangers of Mining

Mining is one of the extra-hazardous industries employing more than 1,000,000 men in the United States, of which three or more of every 1,000 men employed are killed each year by accidents. This, according to Albert H. Fay, of the U. S. Bureau of Mines. Though complete data relating to non-fatal injuries are not available, states Mr. Fay, reports to the Bureau of Mines for all metal mines in the United States show that at least 250 men per 1,000 per year are injured sufficiently to cause loss of time. Approximately the same rate will apply to other branches of the mining industry. A reduction of 50 per cent in the number of mine accidents would mean a saving of at least 1,500 lives in the United States every year, a saving of valuable time now lost and an alleviation of much suffering now resulting from more than 250,000 non-fatal accidents that the records show occur annually in the mineral industries.

The Tenderfoot's Lease

Several years ago in the mining town of Gold Hill, Ore., a local attorney, on arriving at his office earlier than usual, found a new arrival awaiting him. The client, a tall lanky youth of probably twenty summers, was clad in a corduroy suit of tan, with high-laced boots. With a prospector's outfit at his side and a gold-pan in hand he represented the typical tenderfoot of the region. Peering through a pair of rimless lenses, the new comer eagerly addressed the attorney as he drew near. "Say judge, what will be your charges for drawing up a mining lease?" "Five dollars, sir. If it should be an extraordinary document, it will cost you more," replied the student of Blackstone. "Well, judge," began the youth, after he had returned with the lessor, "you make this instrument good and strong—and, I want three carbon copies to post at the mine. I will pay you ten dollars for your services. I just come down from Coeur d' Alene. I had a lease on a mine up there—the blooming thing was showing up fine. Some fellows came along and told me that my lease was no good. They hung around and offered me five thousand dollars for all my right, title, and interest in and to the said premises. I said 'all right.' And—say—judge, what do you think? Well, sir! Those fellows sold that mine the next day for five hundred thousand dollars—a clear net loss to me, of four hundred and ninety-five thousand dollars. Never again—I want one of those leases, that I won't have to sell."

Curves and Nerves

The climate alone was enough to dissuade anyone from staying on the job. Surveying day after day in the rain put the entire corps in an irritable mood, and it was not surprising that the chainmen, rodman, and axemen should drift away under one pretext or another. Came a day when there remained only the fussy general manager, the transit man, and one semi-educated machete wielder to finish the location of the motor-truck road that was destined to link the mine with the river port. The transit man had looked upon his post as but a temporary stepping stone to higher tasks, so it rankled him to see the G. M. usurp his place at the instrument. And still more did it anger him to be compelled to skip about with a stadia rod in accompaniment to weird computations on a slide rule; marking and driving stakes like a mere underling. On the third day of this sort of thing, when ordered to set additional stakes to mark the P. C., P. I., P. T., etc., of various tentative curves, he ventured to argue with his superior anent the foolishness of such attempts to apply railroad survey tactics to a guess-and-by-gosh stadia line. As though by way of punishment for his *lese majesty*, his tasks that afternoon included the setting of some P. C. C. and P. R. C. stakes. By a fortunate coincidence that same day chanced to be pay day. That night some mysterious activities might have been observed at the quarters of the subordinate engineer, including the furtive nailing of boxes and whispered consultations with a couple of camp followers. The next morning he started out on the job bright and early, packing the rod and a stake of unusual dimensions. Hurrying with a halfbreed to the end of the line, he had the instrument set up by the time the G. M. arrived. Stalking on ahead through a cleared space for quite a distance, he affected to misunderstand the frantic signals of his chief. Alternately extending and lowering the rod, moving up and down the hillside but always lengthening the distance between them, he finally dragged his masterpiece into view and drove the stake firmly until it looked like a headstone on a lonely grave. Abandoning the rod, he proceeded up the hillside, mounted a waiting mule, and soon disappeared around a bend in the trail. When the puzzled autocrat reached the stake, he discovered on the hind side of it the neatly crayoned inscription

P. P. C.

PERSONALS

Roy Hardy is engineer in charge of the Divide Extension Mining Co.'s mine.

Richard Taylor is superintendent of the White Caps Mining Co., Manhattan, Nev.

Ellsworth R. Bennett, of Tonopah, recently examined a property near Eureka, Nev.

Charles L. Lawton, manager of the Quincy Mining Co., made a recent visit to Chicago.

Clyde Weed, manager of the Hancock Consolidated Mining Co., is in the East on business.

Col. O. B. Perry is inspecting dredging operations at Pritchard Creek in the Coeur d'Alene district, Idaho.

John D. Ryan has returned to New York after spending a month's vacation at Houghton, Mich.

R. A. Kinzie, of San Francisco, will have charge of mining operations for the Engels Copper Mining Co.

John L. Malm, of the Malm-Wolf Co., visited the Ferris Haggerty properties in Wyoming early in August.

Charles E. Knox is in Tonopah, Nev., in the interests of the Knox Divide Mining Co., in the new Divide district.

W. Parsons Todd, vice-president of the Quincy Mining Co., has returned to New York after visiting the property in Michigan.

Frederick J. Harper has been appointed managing director of the Nitrate Agencies Co., with residence in Iquique, Chile.

J. Parke Channing, president of the Naumkeag Copper Co., operating at Houghton, Mich., made a recent visit to the property.

Rodolphe Agassiz, of Boston, president of the Calumet & Hecla Mining Co., is making his regular visit to the mines in Michigan.

Herbert C. Hoover, head of the Inter-Allied Relief Organization, accompanied by a staff of experts, arrived in Warsaw on Aug. 11.

F. Dean Bradley is in charge of operations at the Goldfield Consolidated Mining Co.'s mill, Goldfield, Nev., for the Goldfield Development Co.

Homer Wilson, of San Francisco, has acquired the property of the Lodi Mines Co., situated some distance from Luning, Nev., and will erect a concentrating plant.

E. E. Hunner, general manager of the Hanna Ore Mining Co., has returned to his duties after a series of serious operations at Johns Hopkins Hospital, Baltimore.

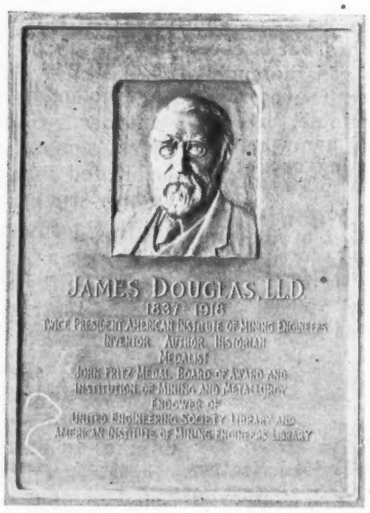
F. W. Draper is in Nevada in the interest of the Louisiana Consolidated Mining Co., which is preparing to work the Tybo mine, sixty miles northeast of Tonopah.

R. M. Kellogg, mining development contractor, who is at present sinking a number of shafts in the Divide district of Nevada, is making a business trip to the Ranger oil field of Texas.

John Fowle, vice-president and general manager of the Silver King of Arizona Mining Co., who has been in California recently on professional business, has returned to Superior, Ariz.

F. G. Cottrell, assistant director of the Bureau of Mines, was delayed in sailing from Europe. Dr. Cottrell had expected to reach the United States Aug. 10, but will not be able to return before some time in early September.

Charles McKinnis, of Wallace, Idaho, manager of the National Copper Mining Co., is sinking two wells near Ranger, Tex. **Myron A. Folsom,** chief counsel for the Bunker Hill & Sullivan company, has a flowing well in the same field.


JAMES DOUGLAS, LL.D.
1837 - 1918
VICE PRESIDENT AMERICAN INSTITUTE OF MINING ENGINEERS
INVENTOR AUTHOR HISTORIAN
MEDALIST
JOHN FRITZ MEDAL BOARD OF AWARD AND
INSTITUTION OF MINING AND METALLURGY
ENDOWER OF
UNITED ENGINEERING SOCIETY LIBRARY AND
AMERICAN INSTITUTE OF MINING ENGINEERS LIBRARY

PLAQUE OF DR. JAMES DOUGLAS

James Douglas' memory was honored recently by the American Institute of Mining and Metallurgical Engineers by the placing of a bronze plaque of Dr. Douglas, reproduced herewith, in the Engineering Societies Building, New York. Dr. Douglas died on June 25, 1918, at the age of eighty-one years, after having devoted his entire life to the advancement of the mining industry. The inscription on the plaque denotes the distinguished honors conferred on Dr. Douglas by his fellow engineers in recognition of his valuable services to the sciences of geology and metallurgy.

Capt. Lionel H. Lehmaier, late of the 4th Australian infantry and prior to the war assayer and metallurgist with the Sulphide Corporation, Cockle Creek, New South Wales, has been appointed the representative in Australia of the Guaranty Trust Co..

C. W. Sherman, of Hamilton, Ontario, president of the Dominion Steel & Foundry Co., has completed a tour of inspection of the Mesabi and Vermilion ranges in company with his brother, **H. S. Sherman,** superintendent of the Hull-Rust mine, at Hibbing.

R. R. Leslie has resigned as general superintendent of El Cubo Mining & Milling Co., at Guanajuato, Mexico, and will devote himself to personal business. **F. H. Lerchen,** who has been his assistant, became superintendent on Aug. 1. Mr. Lerchen is at present in Chicago on business.

E. A. Julian, engineer in charge of the exploration department of the Goldfield Consolidated Mining Co., has assumed the management of the Tonopah Divide Mining Co. and the Brougher Mining Co., succeeding **A. I. D'Arcy,** who is devoting his time to the interests of the Goldfield Development Co.

A. C. D. Bothe, mining and metallurgical engineer, commissioned by the Netherlands government to inspect mining operations in America, spent several days in the Coeur d'Alene district. After visiting other mining sections of the West, he will sail in about a month from San Francisco to Batavia, Java.

Van. H. Manning, director of the U. S. Bureau of Mines, will visit Denver the latter part of August to confer with state and city officials relative to the proposed oil-shale investigations. At present, Denver and Salt Lake are competing for the Bureau of Mines proposed oil-shale plant, for which Senator Henderson, of Nevada, introduced a $100,000 appropriation bill. Director Manning will be the guest of the Colorado Metal Mining Association and the Colorado Chapter of the American Mining Congress at an informal dinner to be held on Aug. 27.

Colonel Frederick Mears has been appointed by the President as chairman and chief engineer of the Alaskan Engineering Commission in charge of the construction of the Government railroad in Alaska. Colonel Mears was a member of this commission, but retired to return to active duty with the Army during the war. He was with General Goethals during the construction of the Panama Canal in charge of the Panama Railroad, and during the war was general manager of the American railroad lines in France. The President has appointed **William C. Edes** as consulting engineer to the commission.

OBITUARY

Harry T. Hobson, aged twenty-six, manager of the Marne Divide property in Nevada, was killed on Aug. 6, 1919, by falling a distance of eighty feet into the shaft. Mr. Hobson was a graduate mining engineer of Stanford University in 1917, and during the war held a commission as lieutenant, being assigned as gas instructor to the school at Little Rock, Ark. Mr. Hobson was also identified with the mining industry in Arizona and Mexico.

INDUSTRIAL NEWS

L. H. Sebbes, until recently with the advertising sales department of the *Engineering and Mining Journal,* has accepted a position as manager of the sales promotion department of the Chicago Pneumatic Tool Co. in the Chicago office.

Goulds Manufacturing Co., of Seneca Falls, N. Y., manufacturers of pumps, will open on Sept. 1 a district sales office in Detroit, Mich., in the Dime Bank Building, in charge of E. B. Gould, who has recently returned after eighteen months' service in France.

Davis-Bournonville Co., Jersey City, N. J., announces that the publication of "Autogenous Welding," devoted to the interests of the company and its employees, will be resumed regularly after having been suspended during the war. The July issue has been named the Victory Number, and is largely devoted to the part played by oxy-acetylene welding and cutting in the war.

Norton Company, since July 1, 1919, has been conducting the business of the Norton Grinding Co. which has been reorganized with the following board of directors: George I. Alden, chairman; Charles L. Allen, president and general manager; Aldus C. Higgins, treasurer and general counsel; George N. Jeppson, secretary and work manager, and R. Sanford Riley and John Jeppson.

The Sullivan Machinery Company announces the appointment of R. S. Weiner as district manager at El Paso, Tex., succeeding Don M. Sutor. Mr. Sutor has been transferred to the company's St. Louis office as district manager for Missouri, eastern Texas, Oklahoma, Kansas, western Kentucky and western Tennessee. The company's office at El Paso remains at Room 511 Mills Building, as heretofore.

Traylor Engineering and Manufacturing Co., Allentown, Pa., announces the return of R. R. Shafter to the company's sales organization after an absence of two years as general superintendent of the Traylor Shipbuilding Corporation, which completed more 3500-ton cargo carriers than any other yard on the Atlantic and gulf coasts. Mr. Shafter will have charge of the New York office, at 30 Church St.

H. Gardner, 2 Metal Exchange Buildings, Leadenhall Avenue, London, announces that he has converted his business into a limited liability company with a capital of £1,000,000, of which £650,000 has been issued and fully subscribed. All contracts and liabilities are taken over by the company, which will likewise receive all debts. Directors are: Henry Gardner, chairman; Walter Gardner, Sir Woodburn Kirby, George E. Leon, and William Murray.

Goodyear Tire & Rubber Co., Akron, Ohio, has established a week-end traveling sales school, composed of capable instructors, who will visit the men in the various branches of the company. They have recently covered Louisville, Memphis, and New Orleans. At present they are in Indianapolis. In the eleven years of its existence, the company's relief association has paid $78,899.10 compensation for sickness and accident to 4,164 of its members. Death benefits for the same period amounted to $157,878, covering 158 recorded deaths.

Chicago Pneumatic Tool Co. will remove its general offices from Chicago to No. 6-8 East 44th St., New York. The company is erecting a ten-story building of combination brick and limestone, to be ready for occupancy early in 1920, at which time the transfer will be effected. The construction work will be done by Westinghouse Church Kerr Co. The purpose of the transfer

CHICAGO PNEUMATIC TOOL CO. BUILDING, 6-8 E. 44TH ST., NEW YORK

is to facilitate the administration of the company's six American plants and twenty-six sales and service branches.

TRADE CATALOGS

"C-H Mine Duty Apparatus" is the title of an 8-page 8½ x 11 in. pamphlet issued by The Cutler-Hammer Mfg. Co., Milwaukee, Wis. Special reference is made to the mine-duty apparatus installed in the plant of the St. Louis Smelting & Refining Co. at St. Francois, Mo. The method of handling the ore from three levels until it is ready for shipment is given, as well as a discription of the hoist and conveying machinery and the automatic control and safety apparatus used. The illustrations show the mine-hoist control panel, switches, overspeed governors and electrically operated brakes; also the automatic starters for the crushers and conveyors, which are controlled from push-button stations. The speed of the conveyors and crushers is governed by armature regulators.

NEW PATENTS

U. S. patent specifications may be obtained from the Patent Office, Washington, D. C., at 5c each.

Blast-Furnace Top. Edwin G. Rust, Philadelphia, Pa. (U. S. No. 1,307,884; June 24, 1919.)

Blast Furnaces—Method of Blowing Down and Blowing Out Blast Furnaces. John W. Dougherty, Beaver, Pa. (U. S. No. 1,309,465; July 8, 1919.)

Clays and Earths, Treatment of. Frank Langford, Eureka, Cal. (U. S. No. 1,308,429; July 1, 1919.)

Crushing Machine. Eugene L. Sanborn, Milwaukee, Wis., assignor to Smith Engineering Works, Milwaukee, Wis. (U. S. No. 1,309,104; July 8, 1919.)

Drill—Electric Well Drill. Robert R. Bray, Los Angeles, Cal. (U. S. No. 1,307,847; June 24, 1919.)

Fuel—Combined Air and Pulverized-Fuel Control. William O. Renkin, Oradell, N. J., assignor to Quigley Furnace Specialties Co. (U. S. No. 1,308,368; July 1, 1919.)

Fuel—Device for Aërating Powdered Fuel. Alonzo G. Kinyon, Chicago, Ill., assignor to Powdered Coal Engineering and Equipment Co., Chicago, Ill. (U. S. No. 1,307,365; June 24, 1919.)

Furnace Linings—Protecting Refractory Furnace Linings. Howard F. Chappell, New York, N. Y. (U. S. No. 1,308,481; July 1, 1919.)

Ore Classifying and Separating Apparatus. Lewis H. Falley, Kansas City, Mo. (U. S. No. 1,307,626; June 24, 1919.)

Ore-Concentrating Machine. Frederick E. Small, Kansas City, Mo. (U. S. No. 1,309,307; July 8, 1919.)

Rare Metals — Process of Making Compounds of Rare Metals. Robert McKnight, Pittsburgh, Pa. (U. S. No. 1,308,911; July 8, 1919.)

Reducing Metal to a Finely Divided Condition, Method and Apparatus for. Everett J. Hall, New York, N. Y., assignor to Metals Disintegrating Co., Inc., New York, N. Y. (U. S. No. 1,306,060; June 10, 1919.)

Silicates—Process of Extracting Metals From Silicates. Louis L. Jackson, New York, N. Y., assignor of one-half to Odus C. Horney, New York, N. Y. (U. S. No. 1,305,969; June 3, 1919.)

Steel—Manufacture of Steel. Charles Miris Steel Co., Ltd., London, England. (U. S. No. 1,304,946-7-8; May 27, 1919.) Dear, London, England, assignor to The

EDITORIAL CORRESPONDENCE

Current Events and Topics in Brief of Interest to Engineers and Operators

DENVER, COL.—Aug. 16

The New York-St. Louis Syndicate, a $1.-500,000 corporation, owning 1,320 acres of oil-shale land near DeBeque, Col., and a 5,000-acre oil lease in the vicinity of the shale beds, is letting out contracts for the immediate erection of a retorting and refining plant. The plant will be erected either at DeBeque or Grand Valley, and will have an initial capacity of 1,000 tons per day. It will cost about $250,000. A recent test of the oil shales was made in East St. Louis, using the Wallace process. An average of 45 gal. of oil was extracted from the shale in two and one-half hours. About 30 gal. of gasoline can be produced from "cracking" of a barrel of oil (42½ gal.). in addition to other valuable byproducts. James Duce, Colorado State Oil Inspector, was present when the tests were made, as a representative of Governor O. H. Shoup.

SALT LAKE CITY, UTAH—Aug. 16

Opening of the Uintah Basin is taking definite form, with the prospect of a railroad into the section as a result of efforts on the part of Utah men, with the encouragement of Governor Bamberger. A possible extension of the Moffatt road from Colorado into the basin has been discussed from time to time, and this may be done in the future. The road will start from a point in Utah, the route as outlined making Provo (40 miles from Salt Lake), the outside terminal, and going to Springville, through Hobble Creek Canyon, along the side of the Strawberry River to Duchesne, Myton, and other points in Uintah Basin. At a meeting held at the Commercial Club of Salt Lake City on the evening of Aug. 12, preliminary plans were outlined for the building of the railroad and for the forming of a holding company to take up and work timber, oil-shale, and coal lands in the basin. The sum of $29,000 in individual subscriptions of $1,000 was pledged to go for preliminary expenses. When $100,000 has been pledged, it is planned to make a resurvey of the ground to be covered by the railroad and to undertake the necessary preliminary work of organizing companies to take up options on lands and perform other necessary preliminary work. Chicago men owning coal lands in the section have offered their support in the movement.

WALLACE, IDAHO—Aug. 15

Strike Which Has Been Threatening in the Coeur d'Alene district for several months reached the climax on Aug. 13, when, at a meeting in Wallace, the Coeur d'Alene District Union No 14, a branch of the International Union of Mine, Mill and Smelter Workers, ordered a strike on Aug. 15 at 7 a. m. The mines affected are the Hecla, Hercules, Morning (Federal), Hunter, Interstate-Callahan and Tamarack & Custer. Practically all the employees went out in accordance with the order, and all indications point to a long shutdown. A member of the executive committee of the international union was present at the meeting of the district union and protested against calling the strike, and warned the meeting that if the men went out it would be in defiance of the international union. General McWade was also present and protested in the name of the Government against this radical action. The Bunker Hill and Sullivan was not included in the strike order. However, it is expected that strong pressure will be exerted to close the Bunker Hill also.

The Finding of the Coroner's Jury, after a thorough investigation into the recent accident at the Hecla mine, resulting in four men being instantly killed and three seriously injured, one of whom subsequently died, was to the effect that the death of the man was caused by "an involuntary accident," for which the hoist man was not criminally responsible, a conclusion unquestionably justified by the facts. The men had entered the cage at the collar of the shaft, in full view of the hoist man, and the signal was given to lower to the 2,000 level. The hoist man pushed the control lever of the electric hoist in the wrong direction and sent the cage up to the sheave wheel, with the result as stated, one of the men falling to the bottom of the 2,000-ft. vertical shaft. Later a searching investigation was made by Robert N. Bell, State Mine Inspector, the result of which confirms the verdict of the coroner's jury. His investigation went further, however, and he found that there was a contributing cause which suggests that there is further need of providing safeguards. Mr. Bell describes the hoist as a first motion, double-reel, electrically driven plant, with flat cables and massive Lane-type post brakes. The cables are ⅝ in. thick and 5½ in. wide. The contributing cause does not in the least reflect upon the Hecla Mining Co., for Mr. Bell found that every required safety device has been adopted. It simply shows that with all the safeguards provided there is still an element of danger. Mr. Bell says: "Another factor, and a very important one I think, was the fact that two new cables had been very recently put on. These cables when first used are subject to a lengthening stretch of more than seventy ft., and while this stretch is being worked out repeated readjustments of the indicator gears are necessary, and involve the temporary disconnection of the Welch speed controller. This is a sensitive device with which the hoist is equipped, designed to shut off the power automatically and apply the brake when the hoist exceeds the maximum fixed speed in passing a danger point near the terminals of its operation."

MORENCI, ARIZ.—Aug. 14

At Morenci, Ariz., plans have been completed and work is about to start on the new high school. Particular attention is to be paid to vocational training to encourage Mexican boys to remain in school after the state law permits them to seek employment. Comparatively few Mexicans get a high-school training, but if something can be offered in the trades, it is believed that a much larger number will continue in school. A distinct novelty of the new Morenci school is the automobile shop, which is worked in conjunction with the machine shop, forge shop, foundry, wood shop and paint shop.

DULUTH, MINN.—Aug. 15

Great Northern Iron Ore Properties has recently issued the 12th annual report, covering operations for the year 1918. Gross income from the proprietary companies totaled $4,557,000; income from interest and ground rental amounted to $37,-725. Disbursements for salaries, expenses, and income taxes were $72,221. Holders of certificates of beneficial interest profited to the extent of $6,000,000 in dividends of $1 per share on Mar. 15, $1 per share on June 27, and $2 per share on Dec. 17. Undivided profits amounted to $602,278 on Dec. 31. One new lease was recorded in 1918, being that of the Wade property at Kinney to the Cleveland Cliffs Iron Co. and the Struthers Furnace Co. The company has profited largely by the recent improvements in washing practice and will continue to benefit, as large acreages are held in the western Mesabi district.

MINA, NEV.—Aug. 16

Recent Reports From Active Companies in the Mina district indicate that Mina may soon be a center of activity of southern Nevada. The Consolidated West Extension Simon Mines Co.'s shaft is being sunk rapidly. The three-compartment shaft is now down to the 100-ft. level, and the contractors are sinking at the rate of 3 ft. a day. The last 30 ft. is in a manganese and calcite vein, which shows signs of strong leaching action. The gangue matter shows a considerable amount of iron pyrites. Reports from the property of the Norman Silver Mining Co., situated about one and one-half miles from the Simon silver-lead mine, are to the effect that a body of ore has been opened in the bottom of the shaft at a depth of 50 ft. At present the shaft is in 3½ ft. of ore. The shaft is a two-compartment one, and is in a contact between lime and granite. The management expects to sink to a depth of 200 ft. and crosscut on the 100- and 200-ft. levels. An additional discovery is reported by the management of the Fagan Mines Co. where a body of galena having a width of 4 ft. is exposed at the bottom of a 30-ft. shaft. In addition to the lead contents, it is stated that assays show silver and gold. The mine is situated about two miles south of the Simon silver-lead mine and adjacent to the Norman silver mine.

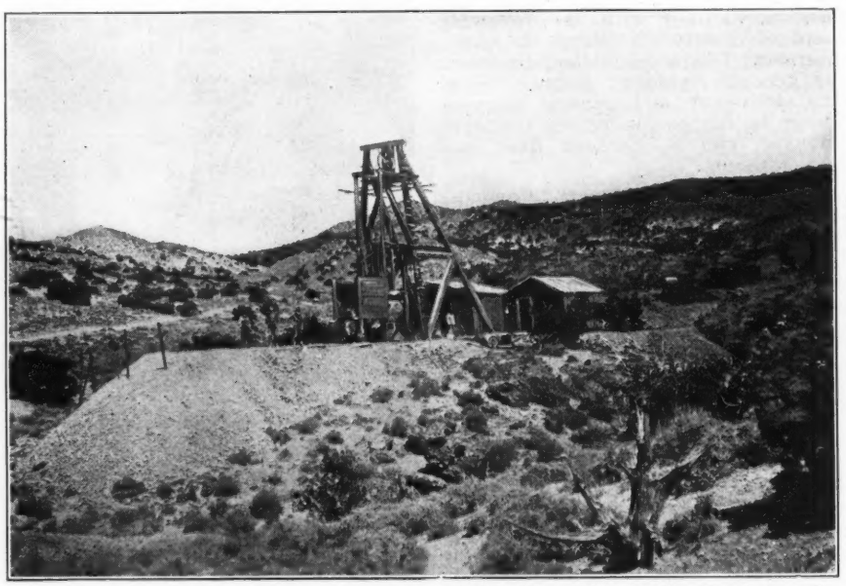


Photo by Fred L. Miner, Editor "Western Miner," Reno, Nev.

SIMON SILVER-LEAD MINE, SHOWING SHAFT EQUIPMENT AND EXPERIMENTAL FLOTATION PLANT

ELY, NEV.—Aug. 15

Strike of Employees of the Nevada Consolidated at Ely threatens serious privations to inhabitants of towns in that region, owing to interruptions in train service to that point, isolated in 140 miles of desert. The trouble was apparently the result of the unexpected strike of shopmen and minor crafts on the Nevada Northern Ry., which quickly tied up traffic on the road between the mine and mill, making the shutdown of the mill and smeltery imminent. Meanwhile, mill and smelter men announced that unless an increase of wages of $1.25 per day, together with minor demands as to working conditions, were granted before a certain hour on July 29, they would quit at that time, which they did. The smeltery management had anticipated this action, and no charges were in the furnace. The company meanwhile offered an increase of 75c. per day, claiming that this brings wages to within 25c. of pre-armistice levels and was all that the copper market warrants and would establish a scale equal to or greater than that in any other copper camp. The men receded to a wage demand of practically 25c. higher than the company's offering, and the deadlock ensued. The company's strategic position is good, with considerable quantity of unsold copper and with the larger operations of affiliated interests at other points it can well afford to abandon operations indefinitely in this high-cost property. Though trainmen are not on strike, there is no one to keep the rolling stock in operating order, and therefore train service to Cobre, the connecting point on the Southern Pacific, has been extremely erratic, causing much inconvenience and a prospect of serious famine in Ely. Announcement was made that the company will be unable to operate trains after Aug. 16. The efforts of Governor Boyle of Nevada, the Nevada Railroad Commission and Federal Mediator Davies have been so far unavailing. Both at Ely and at the general headquarters at Salt Lake City both sides are holding out. The inhabitants of the district are wondering what they will do when the present limited stocks of staple groceries are consumed. Practically no dairy products are available. The San Francisco Exchange has closed because of labor troubles in Nevada.

AUSTIN, TEX.—Aug. 6

All Pipe Line Companies are held to be common carriers, and must make monthly reports to the Texas Railroad Commission, according to a ruling of the Attorney General. This ruling applies to small as well as large companies, even though handling oil from only one well or company. Pipe lines owned by refineries and used to convey oil direct from the wells to the refinery do not fall under this ruling.

Motion To Modify Injunction against Texas and Prairie companies and other oil companies was taken under advisement by the district judge. The case involves the right of the state to grant a legal lease to one Giraud, of Austin, on a strip of ground left vacant between two surveys, subsequently found to be wrong, in the Ranger field. In addition, Giraud sold to the Humble Oil & Refining Co., and that company obtained an injunction against the other companies preventing them from drilling not only on this strip but within a certain distance on either side. This case will set a precedent, and is of great importance.

COBALT, ONTARIO—Aug. 15

The Labor Situation in the Cobalt camp remains practically unchanged. Though a number of attempts have been made to bring about a settlement of the trouble, the only one that holds out any promise of success is that by the returned soldiers. A short time ago the returned soldiers of the district held a meeting, and sent a deputation to Ottawa to interview the Minister of Labor. They were informed there that the Department of Labor would appoint a board of conciliation, but that before doing this it would be necessary for the striking miners to return to work. This, of course, would necessitate a return under the old conditions and rates of pay. This was refused by the miners' union executive, who also refused to take a vote on the question, either a standing vote or a secret ballot. In the case of a standing vote, there is no doubt that a considerable number of the men would have been in favor of this, whereas, if a secret ballot had been held, there is every reason for believing that the majority would have been in favor of it.

Upon the refusal of the union executive to consider this proposal, the returned soldiers held another meeting, and decided to form another union, having no connection with an international organization, and from which aliens would be excluded. Though nothing definite has yet been done regarding the formation of a new union, and committee of the returned soldiers is meeting the mine managers of the camp to find out what their attitude would be under these circumstances. There seems to be no question that the operators would allow the men to return to work, without discrimination, at the old rates of pay and bonus system. They would be prepared to deal with and recognize a union which had no affiliation with the Western Federation. There is every reason to believe that the mine managers and the returned soldiers' committee will meet in a spirit of conciliation, and that if the returned soldiers' committee can carry out the program that it has outlined, there is a fair chance that the strike will be called off in the near future. In the meantime, none of the mines is making any attempt to work, and the lower levels are being filled with water.

VLADIVOSTOK, SIBERIA—July 17

Little Activity is in evidence throughout the country, and there are hardly any recent developments of importance to record. The dredges of the Orsk Goldfields, Ltd., continue operating in the Ochotsk Province, as they have been all through two revolutions. The Lenskoie company is reported to be operating. On account of the low price being paid for gold, namely Rs. 50 per zolotnik, equivalent to about $9 per oz. for average 800 fine placer gold, at today's exchange (Rs. 50 to the dollar), the government is getting little of the output from small miners, who are selling to Chinese merchants along the border, and the gold is taken out of the country.

According to reports, the Te-Tu-He zinc mine is being operated by Bolsheviks, who have possession of it.

The Far Eastern Development Co., Ltd., is planning only for work on the Pacific Coast of Siberia in regions accessible by sea transportation and by river freighting on the Amur, as it is believed the railroad will be out of operation for several years.

THE MINING NEWS

Progress of Mining Operations Condensed and Classified for Easy Reference

ARIZONA

Cochise County

SHANNON (Gleeson)—Title to company's property at Gleeson and in Yaeger Canyon (Yavapai County) not included in sale of Metcalf mines railroad, and Clifton smeltery and mill. Reported work will be resumed at Gleeson, shipping high-grade sulphides to Arizona smeltery at Clifton.

Gila County

GIBSON (Bellevue)—Mill has had successful test run. Dumps claimed to have more than 200,000 tons ore.

COLE-GOODWIN (Globe)—Work to be resumed under P. J. Hickey, of Phoenix. Property has 470-ft. shaft and 700 ft. lateral development. Mill proposed.

Pima County

W. P. COTTRELL operating small concentrating mill of his own invention at Greaterville on ores from leases.

PAYMASTER (Tucson)—Reorganization effected under title of Paymaster-Silver-Lead Co. Charles Blenman, of Tucson, president; W. F. Hogan, treasurer and manager. Stock largely held by Andrew Wank, of St. Joseph, and W. T. Lawson, of New York. Property at Olive Camp, twenty-four miles south of Tucson. Profit secured in shipments to El Paso. Mill to be provided for low-grade ores.

Pinal County

MAGMA CHIEF (Hayden)—Property in Copper Creek field has copper ore in shaft at 238 ft. Will drift on orebody at 220 ft.

ARIZONA HERCULES (Ray)—J. T. Shimmin states that flotation machine referred to in the *Journal* of July 26 should not be called the Shimmin cell. Machine being designed to equip one section is similar to Callow machine and resembles Inspiration-type machine. Was designed to fit into present flotation building and flow sheet.

DAGGS (Superior)—Group of thirty-two claims bonded by Consolidated Holding Co., mainly comprising Hugh Daggs and P. H. Hayes, of Phoenix, to Grand Pacific Syndicate, for $450,000. Prospective buyer, which already owns much adjoining ground, is composed of New York and Pennsylvania capitalists, headed by C. C. Steinbrenner. Property has copper outcroppings. Was under bond to Calumet & Arizona several years ago.

MAGMA (Superior)—Driving service tunnel with face 12 ft. square, through newly acquired Queen Creek ground to tap shafts at 500-ft. depth. Concentrating ores are to be trammed to mill.

MAGMATIC (Superior)—J. C. Goodwin to resume sinking of main shaft, which has cut large manganese body outside of copper vein.

SILVER KING OF ARIZONA (Superior)—The new shaft is now down 230 ft. and has cut a streak of ore assaying 130 oz. silver to the ton; at 212-ft. depth streak assaying 116 oz. silver was cut. Altogether, four streaks have been cut, all in light-colored porphyry, the country rock. As shaft is being sunk 150 ft., outside main ore chimney in country rock, these discoveries are interesting and encouraging.

Santa Cruz County

TRES DE MAYO (Nogales)—Situated twelve miles east of Nogales, operated by Bachman-Merritt Co., is shipping silver-lead concentrates to El Paso. Plans made for new mill to handle vanadanite, of which 8,000 tons already have been blocked out in parallel formation.

Yavapai County

DUNDEE (Jerome)—Two shifts sinking shaft, now below 800 ft., on way to lateral connection with Extension tunnel, which will provide advantageous transportation for ores. Humboldt smeltery may get ores from carbonate blanket, which has proved length of 300 ft. and width of 60 ft.

JEROME DELMONTE (Jerome)—To resume work on shaft, to sink from 450 to 1,200 ft. Heavier pumping equipment and new hoist needed. Company, headed by Henry Lapham, has $160,000 in treasury and has spent $140,000.

JEROME MANHATTAN (Jerome)—Reported about to resume, after two years idleness.

Yuma County

SWANSEA LEASE (Swansea)—Has secured order from Corporation Commission for reopening of Swansea railroad to Bouse, for ore shipments. Commission was advised that drilling had developed much larger and richer orebodies than heretofore worked, flotation mill had proved successful and that operating force was to be increased from 50 to 200 men. Lease held by W. A. Clark interest. Railroad controlled by George Mitchell, of Los Angeles, Cal.

CALIFORNIA

Alameda County

WESTERN MAGNESITE DEVELOPMENT COMPANY (Livermore) — Five-

year lease granted to Charles S. Maltby. Charles H. Spink to be retained as general manager. Has contract to furnish 20,000 tons of magnesite during the coming year. Calcining plant at Red Mountain, 39 miles southeast of Livermore, will be enlarged. Six trucks employed hauling product to Livermore.

Calaveras County

CALAVERAS COPPER (Copperopolis)—Mill including flotation plant being made ready for early resumption of work. Smeltery now being overhauled.

NAPOLEON MINES (Milton)—Mill and flotation plant to be operated under ten-year lease held by L. D. Adams.

SHEEPRANCH (Sheepranch) — Stamps of old mill are now dropping, and electric pump with capacity of 2,000 gal. per min. installed in mine. Ore being developed by winze 200 ft. below 1,500-ft. level.

Kern County

KELLY-WILLIAMS (Randsburg) — To be operated under name of California Rand Silver. Incorporated with fifteen owners. Since June 15, seventeen cars high-grade ore shipped. Air compressor now being installed. Ratio of silver to gold remains consistently three to one in value.

Nevada County

BULLION MINES (Grass Valley)—Transfer of property, comprising 130 acres, to Grass Valley Bullion Exploration Co., with George F. Mainhardt as manager. Was developed by 1,500-ft. inclined shaft. Closed for fifteen years. Will start at first to unwater old shaft.

Plumas County

ENGELS COPPER (Engelmine)—Completed and placed in successful operation a tailings dewatering plant with capacity of 2 000 tons per 24 hours.

WALKER MINING (Portola) — Preliminary work started on aërial tramway from mine to Spring Garden, a distance of eight miles.

Trinity County

ESTABROOK DREDGING COMPANY (Trinity Center)—New 20 cu.ft. dredge handling 10,000 yd. per 24 hours, with good recovery. Office building being erected and five cottages for employees.

COLORADO

Boulder County

SMUGGLER COUNTY MINING CO. (Ballarat) — Now being operated by Missouri and Nebraska capitalists. Recently made discovery of gold-silver tellurium ore on parallel vein 60 ft. west of the old Smuggler lode. Extent of oreshoot not yet known.

NIL DESPERANDUM (Boulder) — In Sunshine district; beginning an active development campaign. Recently purchased 11 claims which adjoin the Interocean mine, which was acquired in 1917. Will operate the whole group through the American shaft, now 525 ft. deep. Plan to sink deeper.

Clear Creek County

THEODORE R. HEINRICHS, of New York, was in Georgetown recently and ordered new equipment for further development of the St. George property on Douglas Mountain.

SILVER PLUME CONSOLIDATED (Silver Plume)—Operating on Brown and Sherman mountains. Advancing its tunnel 100 ft. a month since installation of new compressor plant last June. Considerable ore being developed, and company has contracts for construction of small cyanide plant for treatment of low-grade silver ores. Dump at the Snow Drift mine will also be milled.

La Plata County

HIGH PRICE OF SILVER is stimulating mining activity in this section. The following contracts have been let: Cave Basin Mining Co., small amount of development work and assorting of ores on Holbrook-Eclipse for shipping; Harry Lawson Co., a series of contracts on Mary Mine, requiring two years to complete work; Blue Grouse Co. to sink a 100-ft. shaft; Black Prince, a long tunnel to cut lime porphyry contact, which is apparently a much-mineralized contact, judging from the surface indications.

Larimer County

SHOWING OF OIL has been encountered in the Rathvon well of the United Oil Co., five miles south of Loveland. Well now 1,300 ft. deep. Structure is similar to that in the Boulder field, but much shallower.

Ouray County

CAMP BIRD (Ouray)—Further development work will be suspended on main vein in the east tunnel until completion of 450 ft. ventilating raise connecting with the ninth level of the No. 3 shaft. Over 2,000 ft. of development work done on this vein. Puzzling geologic feature of vein is the fact that a cross cut driven 200 ft. south from it showed alternating streaks of quartz and altered andesite.

Park County

MOSQUITO GULCH SILVER (Alma)—Has opened good ore between Orphan Boy and Hock Hocking mines. Claims worked include Gold Coin, Little Eva, Fraction, and Little Edith.

San Miguel County

GOLD RUN (Telluride)—Incorporated by John L. McMenamin, W. L. Kennedy, and R. C. Wood, to treat tailings found in the river below Pandora, the accumulation of the mills from the Savage basin, Marshall basin and other companies above Pandora.

Summit County

FRENCH GULCH DREDGING CO. is making excellent progress this season. The dredge handled 180,000 cu.yd. during May and June, or 2,908 cu.yd. per 24-hour day, including shutdown for cleanups. The dredge is rated for only 2,000 cu.yd.

Teller County

DEXTER (Cripple Creek)—Contractors on Anderson & Benkelman lease on Dexter and Trail mines sunk double-compartment Dexter shaft 65 ft. in ten days working two shifts. Sinking started from 15th level, with 100 ft. to go. Lease expires in November and efforts will be made to extract ore on new level by that time.

MODOC (Cripple Creek)—Operating the Modoc and Last Dollar Mines on Bull Hill. Completed retimbering shaft and extensive developments being resumed. Constructing up-to-date ore-sorting house, and expect to have it completed Sept. 1.

WAR EAGLE (Cripple Creek)—On Aug. 5 directors held special meeting to discuss active developing campaign they have engaged in with the Blue Flag Gold Mining Co. Directors who attended were: Samuel J. Burris, of Denver; Thomas Munson, of Sterling; Thomas Annear, of Denver; Judge Tully Scott, of Denver; T. R. Countryman, and Mollie O'Brien, secretary.

PORTLAND (Victor)—Cave-in on surface near collar of Portland No. 1 shaft seriously interfered with production. Steel trestle being constructed over cave, and within a week shipments are expected to be resumed.

IDAHO

Adams County

RED LEDGE (Landore) — Minnesota owners are said to be considering expenditure of $1,000.000 in development, if further work confirms present indications. Diamond-drill explorations said to be satisfactory. Properties are on Idaho side of Snake River, seventeen miles from Homestead, Ore., nearest railroad point.

Bonner County

ARMSTEAD (Kootenai Lake)—Orebody 5½ ft. wide cut in third crosscut below No. 2 tunnel level. Lies between well-defined walls at depth of 1,394 ft. on dip of vein. Fourth and last crosscut proceeding toward vein. After this is reached in about month, development will proceed and ore will be blocked out.

IDAHO GOLD & RUBY (Leonia)—John M. Schnatterly, president, issued statement to stockholders. Large ditch on which steam shovel has been working several years is completed. There remains to be completed a short flume and control head where water will be diverted into ditch. Also laying of large steel pipe line, setting up hydraulic giants, and construction of sluice boxes for washing gravel containing gold, platinum, rubies, and black sand.

FALLS CREEK (Sandpoint)—Two feet of shipping ore struck.

Boundary County

IDAHO CONTINENTAL (Porthill)—Ore shipments resumed with thirteen motor trucks, each making two trips in twenty-four hours, hauling four tons per trip over twenty-six-mile route. Cost of hauling averages nearly $15 a ton. Recently shipped 400 tons to International Smeltery, Utah. In all, 150 men employed.

Custer County

EMPIRE COPPER (Mackay)—Lessees shipping 1,500 tons monthly.

Shoshone County

HYPOTHEEK (Kingston)—J. H. Kern, of Moosejaw, Sask., president, recently inspected property, now idle. Will resume operations when mining costs and lead market more favorable.

TARBOX (Saltese, Mont.)—Putting in pipe line for water power. Preparing plans for mill. Large amount of lead-zinc ore available, and work suspended in mine pending mill construction.

SHERLOCK PLACER (Wallace) — Includes twelve claims on upper St. Joe River. S. H. Hayes, representative of California dredging company, prospecting ground last month. Other possible dredging ground adjacent.

SUCCESS (Wallace)—M. E. Gardner has sold his lease of ground from No. 2 tunnel to surface. In eleven months he shipped ten carloads of crude lead-silver ore, which netted $5,000. Thompson lease working ground between No. 2 and No. 7, ore from this lease being both lead and zinc, requiring separation in mill. Zinc concentrates stored, over 500 tons being on hand.

MICHIGAN

Copper District

WHITE PINE (Ontonagon)—Suspended operations last spring. Expects to resume. Many former employees were employed in lumber work on contract for Ontonagon County interests.

MICHIGAN (Rockland)—Produced 39.07 lb. of copper per ton, in July, highest return in Lake Superior district. Stamped 4,715 tons and 184,175 lb. copper recovered. Drifting at rate of 110 ft. per month on 4th and 7th levels east toward proposed new shaft. Working on rock shafthouse. Improvements to permit doubling rock hoisting capacity.

VICTORIA (Victoria)—Produced 6,000 tons rock in July, recovering 164,205 lb. of mineral, including mass copper. Return averaged 16.5 lb. per ton, being 2 lb. better than June.

Gogebic Range

DOCKWORKERS' STRIKE at Ashland continues, with no prospect of a settlement. Mines on range are consequently curtailing operations, and some men have been laid off. Crews of some of the vessels at the docks have also been laid off.

MINNESOTA

Cuyuna Range

MEETING OF MANGANIFEROUS PRODUCERS of the range was held in the City Hall at Ironton on Aug. 8 for tne purpose of effecting an organization to fight for a protective tariff on manganese and manganiferous ores. Temporary organization effected, and plans laid for a meeting in Duluth in the near future.

MANGANIFEROUS PRODUCERS who have put in claims under the War-Minerals Relief Act have their hearings before the commission at Denver, starting Aug. 18, The following Cuyuna companies have claims: Onahman Iron Co, Mines Efficiency Co., Arko Mining Co., Whitmarsh Mining Co., George H. Crosby, Oneida Mines Co., Gloria Mining Co., Northern Minnesota Ore Co., Joan Mining Co., Hopkins Mining Co.

STRIKE OF SHOPMEN on railroads was followed by strike of certain ore dock men, and placing of embargo on shipments of ore and forest products. All open pits and those underground mines which were shipping and did not have stockpiling arrangements were forced to close down the latter part of week of Aug. 4.

JOAN No. 3 (Crosby)—Unwatering shaft, which was started last year and closed down about Dec. 1. Now at depth of 62 ft. Will sink to 108 ft. and drift to orebody. High-grade manganiferous property.

MEACHAM (Crosby) — Sinking shaft deeper.

CUYUNA-DULUTH (Ironton)—Finished loading out of stockpile and started underground operations, Aug. 4.

ONAHMAN IRON (Trommald) — Reported Algoma Steel Co. will take its 40,000 tons of manganiferous ore from these properties, Ferro and Algoma, which it has contracted for under a long-time contract; 50,000 tons in stockpile at both properties.

Mesabi Range

MILLER (Aurora)—Pitt Iron Mining Co. plans to install milling system.

MADERIA (Hibbing)—State has let contract for filling old shafts and test pits on property abandoned as worked out.

NORTH EDDY (Hibbing)—New shaft now at 200-ft. level where first drifting will be started. Dean Iron Co., operators.

SOUTH AGNEW (Hibbing)—Shaft No. 2, which has encountered considerable quicksand, has been successfully ledged in broken taconite at depth of 165 ft. Ultimate depth to be 235 ft. Interstate Iron Co., operators.

MONTANA

Beaverhead County

BOSTON & MONTANA DEVELOPMENT (Wise River)—Drifting on the 900 of Idanha showing continuous ore of milling grade, with width from 10 to 15 ft. Upper Idanha cross-cut expected to reach Central vein about the middle of the month. Ground softening.

Jefferson County

AMALGAMATED METALS (Clancey)—Showing reported good, with occasional shipments being made to East Helena smeltery.

LEGAL TENDER (Clancey)—Reported on self-sustaining basis. Installation of compressor and electrical hoist in progress.

LIVERPOOL (Clancey)—Unwatering of workings continuing, with retimbering of shaft, which is badly caved in places.

ANGELICA (Wickes)—Good orebodies on lower levels. Fairly regular shipments to reduction works being made.

Missoula County

POTOMAC COPPER (Potomac)—No. 4 tunnel cleaned and enlarged for distance of 500 ft. Will be necessary to drive 1,000 ft. more to attain depth of 600 ft. under Copper Cliff. The No. 4 tunnel continued will develop the Leonard group of claims at depth of 1,500 ft. No. 3 tunnel also being cleaned out.

Powell County

MONARCH (Elliston)—Compressor installed, together with sawmill. Driving main tunnel.

Silver Bow County

ANACONDA COPPER (Butte)—Outlook for early return to normal stated by officials to be poor. Scarcity of labor, water shortage, and labor troubles operating against capacity production, and little better than 60 per cent at any time this year is expected. Present output around 50 per cent. All of company's larger zinc producers have suspended, and miners have been transferred to copper properties.

BUTTE & SUPERIOR (Butte)—No. 2 shaft of Black Rock will be sunk from the 2,050 level to the 2,350 when the local labor situation clears. Ore deposit now has been opened for continuous distance of approximately 2,000 ft. east of the territory now in litigation with the Elm Orlu. Production for July, 7,800,000 lb. zinc in concentrates and 150,000 oz. silver, June production, 9,750,000 lb. zinc in concentrates and 185,000 oz. silver.

DAVIS-DALY (Butte) — Twenty-one hundred drift of Colorado mine reported in good ore, indicating upward situation of rich zone in evidence on 2,300, 2,400, and 2,500. Development regarded as important in establishing a guide as to finding ore on the 1,700, the 1,200, and the 1,000.

EAST BUTTE (Butte)—Produced 1,458,420 lb. copper in July; June, 1,513,360; July, 1918, 2,076,460.

NORTH BUTTE (Butte)—Production increased to more than 50 per cent of normal. Ore reserves today amount to the highest tonnage in years. Though operating at only 25 per cent of capacity since the signing of the armistice, development has been performed to the limit of the company's ability.

NEVADA

Nye County

LABOR STRIKE prevails in Tonopah and Divide districts, which, in conjunction with the Ely labor difficulties, resulted in the closing of the San Francisco Stock Exchange for one day, and, in the event of a deadlock between the miners and operators, trading on this exchange will be discontinued until the labor difficulties are settled. The miners in Tonopah are asking for $1 increase in wages per day. However, the outlook for the prompt settlement of the differences is good, as the state officials of Nevada have been investigating the situation. Governor Boyle, D. C. Jackling and C. D. Lakenan, general manager of the Nevada Consolidated Copper Co., are holding conferences in San Francisco.

UTAH

Juab County

TINTIC SHIPMENTS week ended Aug. 9 amounted to 126 cars, as compared with 130 cars in the week preceding.

EAGLE & BLUE BELL (Eureka)—Net earnings for 1918, after deductions for Federal taxes, amounted to about $104,630 less than in 1917, although more ore was mined. Falling off due to higher costs and lower price of metals. Surplus of about $150,000 on hand, and mine in good condition. Dividends thus far in present year, $44,657, making total by company $1,205,747 since Feb. 1, 1913.

EAST STANDARD (Eureka)—Grading under way for installation of recently ordered machinery to be used in shaft sinking.

TINTIC EMPIRE (Eureka)—Group of seven claims lying between Lehi Tintic and Tintic Paymaster to be developed by means of shaft work.

TINTIC DRAIN TUNNEL (Eureka)—Present length 400 to 500 ft.; ultimate length to be six miles To unwater large mining area cutting Colorado at 1,900-ft. level and Iron Blossom at 2,200-ft. level.

COLORADO (Silver City)—Drifting being done southward on 1,900 level for continuation of Iron Blossom ore. Expense of work met by shipments.

IRON BLOSSOM (Silver City)—During July earnings somewhat in excess of dividend requirements. Considerable development being done.

Salt Lake County

SURVEY OF COTTONWOOD DISTRICT being made by A. S. Butter and F. C. Calkins for the U. S. Geological Survey.

EMMA SILVER MINES (Alta)—Inspection being made by George H. Dern, newly appointed manager.

SOUTH HECLA (Alta)—Shipping 75 to 100 tons of ore daily. July production 22,709 oz. silver and 122,367 lb. copper.

UTAH COPPER (Bingham)—Total gross production second quarter 1919 was 28,046,978 lb. copper, 27,523,000 lb. contained in concentrates and 523,378 lb. in precipitates from leaching plant. Total gross production quarter preceding, 29,261,209 lb. copper. Extraction second quarter 81.8 per cent, as compared with 74.7 per cent first quarter. Average cost per pound of net copper produced, 11.595c., including plant depreciation and all fixed and general charges, but excluding Federal taxes and without credit for gold and silver or miscellaneous income, as compared with 13.72c. first quarter.

UTAH METAL & TUNNEL (Bingham)—Work to be resumed at this mine.

Summit County

PARK CITY SHIPMENTS week ended August 9 amounted to 1,461 tons, as compared in 1,552 tons week preceding.

DALY (Park City)—Forty men working. Expected to increase output.

JUDGE MINING AND SMELTING (Park City)—Electrolytic zinc plant expected to be operating full force by first of September.

PARK-UTAH (Park City)—Reported work will be resumed in September, to be continued throughout winter.

Utah County

BELEROPHON (American Fork)—Shipment of ore of good grade made, carrying gold, silver, copper, and lead.

WASHINGTON

Stevens County

ELECTRIC POINT (Boundary)—Said to have closed contract for shipment of 2,000 tons to United States smeltery, of Utah. New ore chimney struck, 80 ft. in diameter, 200 ft. from line of Gladstone Mountain Mining Co.

UNITED COPPER (Chewelah)—Value of July shipment almost equal to June, when 10 carloads shipped. One carload a month of high-grade shipped, averaging $125 a ton.

LOON LAKE COPPER (Loon Lake)—Second carload of concentrates shipped, containing 20 to 24 per cent copper and 8 to 10 oz. silver to ton. Shipments expected to be six to eight carloads a month.

CANADA

British Columbia

MOLLY GIBSON (Paulson)—Tunnel in ore 10 ft., and continues to improve.

STANDARD SILVER-LEAD (Silverton)—Second shift added in mill now handling 100 to 150 tons daily. Intend to increase second shift to handle more zinc ore. Output now chiefly from No. 6 tunnel level.

EVENING STAR (Slocan) — Tunnel to be extended 225 ft. to connect with shaft down 135 ft. Hugh Sutherland, owner. William Moore working this and the Silver Nugget.

GOLD BUG-RAMBLER (Slocan)—Reported strike made of 25 ft. concentrating ore, and 18-in. clean silver-lead ore on wall.

INDEX (Slocan)—E. J. Edwards, manager, expects to ship five to seven carloads before Christmas. States vein is 6 to 42 in. wide, carrying silver and lead.

RUTH (Slocan)—Development work has been resumed on No. 6 level.

SILVERSMITH (Slocan)—Third shift added in mill, now of about 100 ton capacity daily. Shipped three carloads in July and two on Aug. 1. Face of oreshoot on eighth level 14 ft. wide, with 4 ft. clean ore. Drift run on ore for 70 ft. will be continued to end of orebody more than 400 ft. long on 10th level, 200 ft. below.

CONSOLIDATED MINING & SMELTING CO. (Trail)—Will give its farm near city scientific agricultural cultivation to demonstrate whether smoke from its smeltery damages crops, as farmers claim, and may purchase fifteen acres of orchard to be used for same purpose.

Manitoba

GORDON CLAIM (Copper Lake)—Vein recently discovered traced for 6,000 ft.

Ontario

MILLER INDEPENDENCE (Boston Creek) — Arranging for installation of new mining plant and mill. Small steam-driven plant being taken in for use until large electric equipment is ready.

MONDEAU (Boston Creek) — Crosscutting on 140 ft. level has encountered well mineralized vein near shaft.

CASTLE (Gowganda) — Five veins opened on 300-ft. level and crosscutting to tap continuation of Miller Lake-O'Brien vein system.

MATACHEWAN (Matachewan) — Drifting in two directions on 170-ft. level, and also crosscutting.

NELSON CLAIMS (Matachewan)—Exploration resulted in discovery of gold ore, including visible gold.

ATLAS (West Shining Tree)—C. L. Hershman, engineer in charge, reports high-grade ore struck on Evelyn vein in pits at depth of 16 and 14 ft.

WASAPIKA (West Shining Tree)—Shaft down 100 ft. and crosscut in ore for 15 ft. Visible gold showing over whole width.

Quebec

HUNTINGTON COPPER (Eastman) — Purchased last year by Eastern Mining & Milling Co., which has since installed a 100-ton concentrator, using the flotation process. Property has been partially dewatered to permit careful sampling. Official figures show ore reserve of about 6,600,000 lb. of copper in ore down to 100-ft. level. Ore averages about 2.42 per cent copper, and estimated cost of treatment is $5 to the ton.

MEXICO

Guanajuato

CROSBY & AULD successfully operating small plant between Marfil and Guanajuato and treating tailings from patios of haciendas once owned and operated by old Spaniards.

CARMEN-GUANAJUATO (Carmen)—Operating 10-stamp mill and Carmen mine belonging to company. Also have under lease Pinguico mine, owned by Pinguico Mines Co., of Guanajuato.

SAN NICOLAS DEL MONTE (El Monte)—Being worked on small scale, ore being sold locally. Owned by Rocha estate. Abel Solerzano, manager.

KOREA

ORIENTAL CONSOLIDATED (Unsan)—Cable advices show July cleanup amounted to $75,820.

TRANSVAAL

RAND GOLD OUTPUT in July 725,000 oz.; June, 702,000; July, 1918, 736,000.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices,
Metal Market Conditions, Average
Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Aug.	Sterling Exchange	Silver		Aug.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
14	430½	112¾	58⅞	18	425	112¼	59⅜
15	429	112⅝	59	19	420	111½	59¾
16	427	112⅝	59⅜	20	413	110	59⅞

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Daily Prices of Metals in New York

Aug.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot	N. Y.	St. L.	St. L.
14	22	55	5.60@5.70	5.40	7.50 @7.55
15	22	54¾@54	5.60@5.70	5.50	7.55 @7.65
16	22⅜	54	5.65@5.75	5.50@5.60	7.55 @7.65
18	22¾@23	54@53	5.75@5.85	5.60@5.70	7.60 @7.70
19	23	54	5.80@5.90	5.60@5.70	7.65 @7.70
20	23@23.10	54@54½	5.90@6.00	5.60@5.70	7.65 @7.70

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M.		Spot	3M.	Spot	3 M.	Spot	3 M
14	92½	93½	103	280	264	25⅛	25⅝	39	40½
15	98¼	99¼	105	271½	266½	25	25⅝	39	40½
16	...	...	...	...	...	...	...	...	...
18	101¾	102¾	107	271	265½	25	25⅝	40½	41½
19	100	101	107	272	267	25	25⅝	41	42
20	101¾	100	109	274½	269½	24⅞	25½	40½	41½

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Metal Markets

New York, Aug. 20, 1919

While there was no special increase in activity this week, copper, lead, and zinc each rallied very well and closed at higher prices than at the openings of the week. This movement probably reflected the completion of the liquidation of speculative accounts.

Transatlantic freight rates remain unchanged at $18.

The rates from San Francisco to Hongkong and Kobe were advanced to $14.

The great decline in francs and marks and sterling exchange has made export business more difficult than ever.

The stocks of metals in the hands of the British Munitions Ministry on Aug. 1, 1919, with the corresponding figures for July 1 given in parentheses, were as follows: Copper, 83,395,200 lb. (99,227,520); lead, 120,971 short tons (135,671); zinc, 39,540 short tons (44,140); aluminum, 23,520,000 lb. (23,874,080); nickel, 5,491,480 lb. (5,492,480); antimony, 4,940 short tons (4,892).

Copper

The firmer tendency that was already in evidence at the time of our last report continued, and the market became distinctly stronger from day to day. Without any doubt this reflected the completion of the liquidation of speculative accounts, on which realization was desired. Some consumers, including some big ones, came into the market and cleaned it up, not only for the sake of obtaining relatively cheap copper, but also to check any further decline, which might have been prejudicial to their own interests. With this powerful support, the market rallied promptly, and speculators who had gone short on the decline had to pay higher prices to cover. A considerable part of the business this week was apparently speculative short covering.

The big producers maintained their previous prices of 23½c. asked for August-September, and 24c. for the last quarter of the year, both prices being for copper delivered. No sales were made by them this week, except a few transactions involving special conditions, but today more inquiry developed, and it seemed not unlikely that the principal producers might realize their prices presently.

Germany inquired for small quantities of copper this week, but wanted to buy in marks and at prices far below our market. It is said on good authority that Germany has more copper on hand than is immediately needed, speaking generally, but is short of some special shapes, particularly wirebars.

Copper Sheets.—The base price of copper sheets is 33½c. per lb. Demand strong. Copper wire is quoted at 26⅜c. in carload lots, f.o.b. mill. Market is strengthened, due to reports that second-hand supplies are pretty well sold out.

Tin

The liquidation of new arrivals produced a further decline in this metal, but at the close of the week the market was firmer. A rather active business was done right through the week.

Singapore quoted £263, c.i.f., London, on Aug. 15; £271 on Aug. 18; £273 on Aug. 19; £272 on Aug. 20.

Straits tin for shipment ranged during the week from 53c. to 52c. At the close, August-September shipment was quoted at 52½c., and September, at 52c. American electrolytic was quoted at 55¾c.

Lead

As in the case of copper, consumers came into the market and cleaned up all of the speculative offerings. Being still unsatisfied, they bought also from such producers as had any to sell. Some of the larger producers were so booked up with orders, and were so embarrassed by diminished production, that they could not accept any new business. Some of the consumers who desired to buy large quantities were concerns that had taken a good deal of the Government's lead and now apparently have used it up.

Germany seems to be in great need of lead, her own production having fallen to about 3,000 tons per month. She ought to be able to buy lead from other European countries that are overstocked, but for some reason she seems

to be unable to get it. There have been German inquiries for bonded lead in this market, but the figures that have been mentioned have been too low.

Zinc

On some good buying by galvanizers, the market advanced further. There was also a better demand for high-grade zinc, which was sold at 8¼@8½c., delivered in the East.

Germany has continued to offer zinc in the British market. The break in the latter occurred about July 21, when the Germans offered about 2,000 tons. Since then the German sales are said to have amounted to about 10,000 tons. This selling was doubtless for liquidation of the surplus existing in Germany, which at the mid-year was said to be about 50,000 tons. German production of zinc, which was maintained at a high figure during the war, has now fallen off greatly, and at present is said to be no more than 5,000 tons per month. The falling off is ascribable to the high cost of coal, to the bad labor conditions, and to the turmoil in Upper Silesia, which is the greatest zinc-producing district.

Zinc Sheets—The quoted price of zinc sheets is $10 per 100 pounds.

Other Metals

Aluminum—Virgin metal quoted at 33c. per lb. No change. Market quiet.

Antimony—The market was very quiet and was easier. Business was done at 9@9¼c. in the early part of the week, but at the close spot was easily obtainable at 8¾@8¾c. Futures were quoted at 9c. duty paid.

Bismuth—Quoted at $2.95 per lb.

Cadmium—Quoted at $1.50 per lb.

Nickel—Ingot, 41c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Unchanged at $109, market quiet. San Francisco telegraphs $105, firm.

Silver and Platinum

Silver market in London has been steady, with advancing prices on buying said to be for the Continent. New York price has been seriously affected by the severe drop in sterling exchange, with lessened demand by China buyers, and closes at 110c., with uncertain tendency.

The general stock of money in the United States on Aug. 1, 1919, totaled $7,525,115,361; of this $2,989,548,109 was in gold coin and bullion, $308,978,930 in standard silver dollars, and $242,876,099 in subsidiary silver. The money in circulation on Aug. 1 was $5,778,565,018, or $54.40 per capita. On Aug. 1, 1918, the per-capita circulation was $52.44.

Mexican dollars at New York: Aug. 14, 86⅜; Aug. 15, 86⅝; Aug. 16, 86⅝; Aug. 18, 86⅝; Aug. 19, 85½; Aug. 20, 84⅜.

Platinum—It is conjectured that the Government has stopped selling its platinum, which heretofore it has been offering at $105. During this week there was a strong market, and producers realized up to $110. We quote $105@$110 for the week.

Palladium—Unchanged at $120.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 16—Zinc blende, per ton, high, $51.90; basis 60 per cent zinc, premium, $48.50; Prime Western, $47.50; fines and slimes, $45@$42.50; calamine, basis 40 per cent zinc, $30. Average settling prices: Blende, $48.09; calamine, $30; all z[illegible] ores, $47.69.

Lead, high, $70.25, [illegible]s 80 per cent lead, $67.50@$62.50; [illegible]erage settling price, all grades of lead, $66.99 per ton.

Shipments the week: Blende 6,274, calamine 84, lead 1,746 tons. Value, all ores the week, $390,550.

Though producers gained $5 per ton on zinc blende prices, $5 per ton was clipped from the price of lead, closing the week $62.50 basis.

Demand for blende was firm throughout the week, but shipments are seriously retarded because of lack of cars. Sellers, able to hold their ore, turned loose only a small tonnage on this week's price offerings, feeling that within a week or two weeks at the most, a $50 basis will prevail.

Platteville, Wis., Aug. 16—Blende, basis 60 per cent zinc, premium blende base $48. High lead or Prime Western grade advanced from $45 to $47 at the week end. Lead ore, basis 80 per cent lead, $62 per ton. Shipments reported for the week are 1,333 tons blende, no lead, and 124 tons sulphur ore. For the year to date the totals are 62,549 tons blende, 3,675 tons galena, and 9,671 tons sulphur ore. During the week 2,727 tons blende was shipped to separating plants.

Other Ores

Chrome Ore—The market seems to be easier, and the quoted price of $25 per ton, f.o.b., California points, could probably be shaded.

Manganese Ore—Market is very dull. It is quoted nominally at 50c. per unit, c.i.f., Baltimore or Philadelphia.

Molybdenum Ore—Quoted nominally at 75c.

Tungsten Ore—Dull and unchanged as to price.

Other Minerals

Nitrate—Business is being done mostly for immediate delivery, average price being quoted at about $2.95 per cwt., carload lots. Some firms are refusing to quote on futures. It is reported that Government stocks have been nearly liquidated.

Pyrites—Spanish pyrites is quoted at 17½c. per unit for furnace size ore, free from fines, c.i.f., New York or other Atlantic port. Market slow and unsettled; hand-to-mouth buying. Very little ore coming in. Price will decrease with ocean freights.

Sulphur — Export demand from Europe has been very good, and sales are in the main limited by high shipping rates, which vary from $25 to $35 from Gulf ports, according to the port of delivery. The labor situation in the Sicily mines is still unsettled and is likely to remain so for a long time, as the miners prefer other employment and can easily obtain it. American sulphur is being sold f.o.b. Europe under prices asked for the Sicilian product. Prices quoted for export range from $20 to $23 per ton in cargo lots at mine in Freeport, Tex., and Sulphur Mine, La. Domestic supplies are quoted at $18 per ton in carload lots. The latter market is dull.

Iron Trade Review

Pittsburgh—Aug. 19

Labor unrest is the outstanding feature of the iron and steel trade and also the most important market influence. Iron and steel producers are concerned not only as to their own labor but also as to the labor of their customers. On the whole, more labor is involved in the consumption of steel than in its production, and unless labor conditions are at least moderately favorable the consumption of steel cannot be at its maximum possible rate, no matter how favorable all other factors in the situation are.

Superficially, the labor situation this week is better, as the striking railroad shopmen have gone back to work, and the plants at Cleveland, Gary, and South Chicago that were closed or partly closed on account of the failure of transportation service are resuming, but as these strikes had been contrary to orders of the national officials of the union in the first place, the return of the men does not mean that labor conditions are better. In Pittsburgh the motormen and conductors of the trolley system went out on strike at midnight last Thursday, against an award of the War Labor Board which they had agreed in advance to accept, this strike also being against the orders of national officials. The best information is that the steel-mill employes in the Pittsburgh district are not organized to any extent, but it does not follow that they will not strike. A seamless-tube plant near Monessen closed last week, paying off the men and announcing that there is no work for them, as the company has no orders, but the common assumption is that labor troubles were feared. A large sheet plant at Canton, Ohio, closed last Wednesday night because the men demanded recognition of the union. Such cases are sporadic, but they may become common. The steel manufacturers are little concerned with the matter of wage rates, and not greatly concerned as to hours of labor, but as to union recognition they are very strong, believing that the efficiency of their plants would eventually be lost if any union came to dominate.

Though the report of the Bridge Builders' and Structural Society shows that bookings of fabricated steel jobs in July represented 74 per cent of a month's fabricating capacity, against 65 per cent for June and 49 per cent for May, the fabricated-steel bookings are now running relatively light, investors in construction undertakings being evidently disturbed by the unrest

of labor and the fear that construction jobs undertaken could not be carried through according to program.

Steel prices are firmly maintained all along the line, with the exception that there are some concessions on plates, but these are much less marked than a few weeks ago.

Makers of cold-finished steel bars, formerly commonly known as "shafting," have adopted a new list, whereby prices are made by naming a base price subject to extras, this supplanting the former system whereby there was a list subject to a discount. The discount was 17 per cent, whereas the base price now in effect is 3.60c., which means the same actual price. The extras are so arranged that some descriptions of material are advanced slightly, but others are reduced, so that on the average there is a slight reduction.

Pig Iron—The market is firm, but not particularly active, furnaces in blast being well sold up, though there is not a broad enough demand to enable many idle furnaces to get into operation. We quote: Bessemer, $27.95; basic, $25.75; foundry, $26.75; forge, $25.75, f.o.b. Valley furnaces, freight to Pittsburgh being $1.40.

Steel

Steel—The scarcity of sheet bars is even more pronounced, and there is considerable inquiry in the open market. Rolling billets are in poor demand, but there is a moderate amount in inquiry for forging billets. We quote: Billets, $38.50; sheet bars and small billets, $42; slabs, $41; forging billets, $51; rods, $52.

Ferroalloys

Ferromanganese—English producers a few days ago made a drive for business and sold several thousand tons of 80 per cent ferromanganese at about $105, delivered, equal to an average of about $102, c.i.f., when their regular quotation was, and still is, $105, c.i.f. It is not known whether domestic makers had a chance to figure on the business, their regular quotation being $115, delivered. Inquiry is light.

Coke

Coke—The Connellsville coke market has undergone one of its sudden changes. Though two or three weeks ago there was much furnace coke on track, held at $4, but moving at concessions when it moved at all, the whole market has tightened. Sales have been made at $4.50 and $4.75, and $5 is now the asking prices for spot or prompt furnace coke. Foundry coke has continued to stiffen, the market now being $5.50 to $6, according to brand. For several weeks there appeared to be a trifle too much production, but in the last few days there seems to have been difficulty in maintaining previous rates of production. The stronger coal market also has an influence.

MONTHLY AVERAGE PRICES OF METALS

Silver

	New York			London		
	1917	1918	1919	1917	1918	1919
Jan.	75.630	88.702	101.125	36.682	44.356	48.438
Feb.	77.585	85.716	101.125	37.742	42.792	48.027
Mar.	73.861	88.082	101.125	36.410	43.620	48.171
April	73.875	95.346	101.125	36.963	47.215	48.886
May	74.745	99.505	107.135	37.940	48.980	52.104
June	76.971	99.500	110.430	39.065	48.875	53.896
July	79.0010	99.625	106.394	40.110	48.813	54.133
Aug.	85.407	100.292		43.418	49.077	
Sept.	100.740	101.125		50.920	49.500	
Oct.	87.332	101.125		44.324	49.500	
Nov.	85.891	101.125		43.584	48.969	
Dec.	85.960	101.125		43.052	48.492	
Year	81.417	96.772		40.851	47.516	

New York quotations cents per ounce troy, 999 fine London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	106.619
Feb.	23.500	16.763	110.000	78.700	125.000	95.700
Mar.	23.500	14.856	110.000	76.821	125.000	82.071
April	23.500	15.246	110.000	77.300	125.000	82.200
May	23.500	15.864	110.000	77.767	125.000	81.227
June	23.500	17.610	110.000	83.062	125.000	85.900
July	25.904	21.604	119.913	99.576	134.913	103.046
Aug.	26.000		122.000		137.000	
Sept.	26.000		122.000		137.000	
Oct.	26.000		122.000		137.000	
Nov.	26.000		122.000		137.000	
Dec.	(a)		118.447		133.167	
Year	24.628		115.530		130.507	

(a) No market.

Tin

	New York		London	
	1918	1919	1918	1919
January	85.500	67.702	293.227	248.557
February	92.000	66.801	311.525	223.963
March	(a)	67.934	318.875	236.843
April	(a)	72.500	329.905	225.275
May	(a)	72.500	364.217	234.398
June	(a)	71.240	331.925	238.263
July	(a)	68.000	360.347	253.272
August	(a)		380.900	
September	(a)		343.905	
October	(a)		335.543	
November	(a)		323.550	
December	(a)		267.736	
Av. year	(a)		330.138	

(a) No average computed.

Lead

	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.00	37.227
February	6.973	5.057	6.899	4.784	29.00	28.675
March	7.201	5.226	7.091	4.992	29.00	27.952
April	6.772	4.982	6.701	4.722	29.00	24.888
May	6.818	5.018	6.704	4.773	29.00	23.852
June	7.611	5.340	7.511	5.070	29.00	22.544
July	8.033	5.626	7.750	5.408	29.00	23.457
August	8.050		7.750		29.00	
September	8.050		7.750		29.00	
October	8.050		7.750		29.00	
November	8.050		7.750		31.20	
December	6.564		6.324		40.00	
Year	7.413		7.222		30.10	

Zinc

	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	7.836	7.272	7.661	7.922	54.000	56.045
February	7.814	6.623	7.639	6.273	54.000	46.150
March	7.461	6.500	7.286	6.150	54.000	38.500
April	6.890	6.465	6.715	6.114	54.000	36.118
May	7.314	6.429	7.114	6.079	54.000	35.477
June	8.021	6.901	7.791	6.551	54.000	36.763
July	8.688	7.873	8.338	7.523	54.000	41.815
August	8.985		8.635		54.000	
September	9.442		9.092		54.000	
October	8.801		8.451		54.000	
November	8.481		8.141		54.100	
December	8.163		7.813		56.050	
Year	8.159		7.890		54.180	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pittsburgh

	Bessemer‡		Basic‡		No. 2 Foundry	
	1918	1919	1918	1919	1918	1919
January	$37.25	$33.60	$33.95	$31.40	$33.95	$32.40
February	37.25	33.60	33.95	31.40	33.95	32.40
March	37.25	32.54	33.95	31.40	33.95	29.12
April	36.15	29.35	32.95	27.15	33.95	28.15
May	36.20	29.35	33.00	27.15	34.00	28.15
June	36.36	29.35	33.16	27.15	34.16	28.15
July	36.60	29.35	33.40	27.15	34.40	28.15
August	36.60		33.40		34.40	
September	36.60		33.40		34.40	
October	36.60		34.40		35.40	
November	36.60		34.40		35.40	
December	36.60		34.40		35.40	
Year	$36.67		$33.70		$34.45	

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. Exch.†	Aug. 19
Alaska Gold M	2
Alaska Juneau	‡2
Am.Sm.&Ref.,com	74
Am.Sm. & Ref.,pf	102
Am.Sm.Sec., pf., A	90
Am. Zinc	21
Am. Zinc, pf	56
Anaconda	65
Batopilas Min	1
Bethlehem Steel	80
Butte & Superior	25
Butte Cop. & Zinc	12
Cerro de Pasco	51
Chile Cop	22
Chino	42
Colo. Fuel & Iron	42
Crucible Steel	136
Crucible Steel, pf	100
Dome Mines	13
Federal M. & S.	13
Federal M. & S., pf	32
Great Nor., ore ctf	41
Greene Cananea	51
Gulf States Steel	78
Homestake	70
Inspiration Con	58
International Nickel	25
Kennecott	35
Lackawanna Steel	77
Mexican Petrol	171
Miami Copper	26
Nat'l Lead, com	77
National Lead, pf	108
Nev. Consol	17
Ontario Min	6
Ray Con	23
Republic I.&S.,com	84
Republic I.&S., pf	104
St. Joseph Lead	14
Sloss-Sheffield	61
Tennessee C. & C	13
U. S. Steel, com	101
U. S. Steel, pf	116
Utah Copper	81
Va. Iron C. & C	60
Worthington Pump	64

Boston Curb *	Aug. 19
Boston Ely	1
Boston & Mont	.75
Butte & Lon'n Dev	.18
Calaveras	1
Chief Con	3
Contact	.30
Cortez	.12
Crown Reserve	.25
Crystal Cop	.13
Crystal Cop. (new)	.58
Eagle & Blue Bell	2
First Nat. Cop	1
Gadsen Cop	4
Houghton Copper	1
Intermountain	‡.05
Iron Blossom	.25
Iron Cap	13
Majestic	.26
Mexican Metals	.05
Mojave Tungsten	.15
Nat. Zinc & Lead	.09
Nevada-Douglas	.24
New Baltic	3
Oneco	1
Rex Cons	.16
United Verde Ex	.41
Yukon Gold	1

San Fran.*	Aug. 12
Alta	‡.08
Andes	.20
Best & Belcher	.15
Caledonia	.22
Challenge Con	.35
Confidence	‡.25
Con. Virginia	2.20
Gould & Curry	.07
Hale & Norcross	.19
Jacket-Cr. Pt	.20
Mexican	.26
Occidental	‡.40
Ophir	1.62
Overman	.10
Savage	.15
Sierra Nevada	.17
Union Con	.11
Utah Con	‡.03
Belmont	3.50
Jim Butler	.30
MacNamara	.65
Midway	.22
Mont.-Tonopah	‡.15
North Star	.07
Rescue Eula	.19
West End. Con	1.47
Atlanta	.04
Booth	.06
Comb. Frac	.05
Florence	.30
Jumbo Extension	.11
Kewanas	.04
Nevada Hills	.02
Nevada Packard	.20
Round Mountain	.36
Silver Pick	.06
White Caps	.19

Colo. Springs *	Aug. 19
Cresson Con	2.18
Doctor Jack Pot	.03
Elkton Con	.03
El Paso	.14
Gold Sovereign	‡.02
Golden Cycle	1.56
Granite	.10
Isabella	.03
Mary McKinney	.06
Portland	.92
United Gold M	.17
Vindicator	.39

Boston Exch.†	Aug. 19
Adventure	1
Ahmeek	80
Algomah	‡
Allouez	43
Ariz. Com	14
Arnold	50
Bingham Mines	8
Bonanza	‡.20
Butte-Balaklava	.65
Calumet & Ariz	73
Calumet & Hecla	43
Carson Hill	22
Centennial	16
Copper Range	42
Daly West	‡3
Davis-Daly	9
East Butte	18
Franklin	5
Granby	‡73
Hancock	7
Hedley	‡12
Helvetia	5
Indiana	1
Isle Royale	33
Keweenaw	1
Lake	6
La Salle	4
Mason Valley	3
Mass	7
Mayflower	10
Michigan	8
Mohawk	73
New Arcadian	4
New Cornelia	24
New Idria	11
Nipissing	10
North Butte	15
North Lake	1
Ojibway	3
Old Dominion	33
Osceola	58
Quincy	‡72
St. Mary's M. L.	‡67
Santa Fe	‡.35
Seneca	21
Shannon	3
Shattuck-Ariz	‡15
So. Lake	‡3
So. Utah	.35
Superior	7
Superior & Bost	3
Trinity	3
Tuolumne	1
U. S. Smelting	63
U. S. Smelting, pf	47
Utah Apex	2
Utah Con	10
Utah Metal	4
Victoria	3
Winona	‡2
Wolverine	24

N. Y. Curb.†	Aug. 19
Alaska B. C. Met	1
Alaska Mines	.50
Big Ledge	
Butte & N. Y	‡
Caledonia	.38
Calumet & Jerome	.25
Can. Cop. Corpn	1
Cashboy	‡.06
Con. Ariz. Sm	1
Con. Coppermines	6
El Salvador	2
Goldfield Con	18
Goldfield Merger	.04
Hasbrouck Divide	.13
Hecla Min	5
Howe Sound	‡4
Louisiana	1
Magma	‡40
Marsh	.09
McKinley-Dar-Sa	.58
Milford	‡.75
Mother Lode	.49
Mother Lode, (new)	4
Nixon Nevada	‡.35
Ohio Cop	
Rawley	‡2
Ray Hercules	2
Richmond	‡.50
Rochester Mines	‡.19
Silver King of Ariz	1
So. Am. G. & P	10
Standard S. L	
Stewart	‡.24
Success	.05
Tonopah	3
Tonopah Divide	5
Tonopah Ex	2
Tribullion	‡.25
Troy Arizona	‡.10
United Eastern	4
Wilson Silver Mines	.50

Toronto *	Aug. 19
Adanac	.09
Bailey	.03
Beaver Con	.34
Coniagas	2.00
Hargraves	.02
Kerr Lake	5.00
La Rose	.25
Lake Shore	1.00
Min. Corp. of Can	1.25
Peterson Lake	.08
Teck-Hughes	.20
Temiskaming	.35
Trethewey	.28
Wettlaufer-Lor	.03
Davidson	.63
Dome Exten	.30
Dome Lake	.17
Hollinger	6.00
McIntyre	1.50
Newray	.06
Porcu. Crown	.28
Vipond	‡.24
West Dome	.10

* Bid prices. † Closing prices. ‡ Last quotations.